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ILLINOIS ENVIRONMENTAL PROTECTION AGENCY  
DIVISION OF WATER POLLUTION CONTROL  
2200 CHURCHILL ROAD  
SPRINGFIELD, ILLINOIS 62706



## 1981 VOLUNTEER LAKE

### MONITORING PROGRAM REPORT

NATURAL HISTORY SURVEY

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WOODHAVEN LAKE | LEE COUNTY



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1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT  
FOR  
WOODHAVEN LAKE, LEE COUNTY, ILLINOIS

A Cooperative Citizen -  
Illinois Environmental Protection Agency  
Project

May, 1982  
Illinois Environmental Protection Agency  
2200 Churchill Road  
Springfield, Illinois 62706

## TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE</u>
Acknowledgements. . . . .	iii
Introduction. . . . .	1
Background. . . . .	1
Results and Discussion. . . . .	4
Summary and Recommendations . . . . .	10
References. . . . .	12
Glossary. . . . .	13

## LIST OF TABLES

<u>TABLE NO.</u>	<u>PAGE</u>
1. Lake Assessment Summary . . . . .	2
2. Secchi Disc Transparency. . . . .	5
3. Depth of Site . . . . .	5
4. Field Observations. . . . .	7

## LIST OF FIGURES

<u>FIGURE NO.</u>	<u>PAGE</u>
1. Lake Map. . . . .	3
2. Secchi Disc Transparency. . . . .	6

## ACKNOWLEDGEMENTS

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Illinois EPA's Ambient Monitoring Unit, Planning Section, Division of Water Pollution Control, under the direction of Kenneth R. Rogers, was responsible for the design and implementation of the program, as well as preparation of this report. Substantial assistance was provided by the Agency's Public Participation Section supervised by Gloria Craven.

Program coordination was provided by Donna Sefton for the Illinois EPA's Ambient Monitoring Unit and Carol Beim for the Public Participation Section.

Volunteers were trained by Public Participation Coordinators Carol Beim, Bob Hagele, William Hammel, Patrick McCarthy, Vanessa Musgrave, and Dawn Wrobel. Lake maps were prepared by J. W. Hammel and Bob Hagele. Lake assessment summaries were prepared by Patrick McCarthy.

Assessment and monitoring information was provided by approximately 140 volunteers throughout the state.

Data handling was performed by John Little, Jill Hardin, Marilyn Budd, Lori Whalen, Cora Stockton, and Karen Janssen. Data analyses were performed and tabular and graphical outputs obtained by John Little using programs developed for the Tektronix desk top computer terminal by Dr. David J. Schaeffer and Vladimir Chernomordikov.

Donna Sefton, Howard Essig, John Little, John Lesnak, Carol Beim, and Bob Hagele wrote portions of the lake reports. Reports were edited by Planning Section and Public Participation staff, particularly Marilyn Budd and Mary Anderson. The contributions of Robert Clarke and Thomas Davenport are recognized.

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## INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

## BACKGROUND

Woodhaven Lake, a 27 acre impoundment owned by the Woodhaven Association, is located in Lee County, 6 miles northwest of Sublette, Illinois. It was constructed by the damming of an unnamed stream in 1976. Woodhaven Lake has a maximum depth of 30 feet, an average depth of 8 feet, and a storage capacity of 209 acre-feet (Table 1).

Woodhaven Lake serves as a recreational lake used primarily for swimming, fishing, rowboating, and canoeing. Access is limited to organization members and their guests only.

Woodhaven Lake drainage area is estimated to be 60 percent residential. The lake shoreline is primarily pasture or grassland.

Aquatic weeds are considered a substantial problem for Woodhaven Lake. Cropland runoff and fertilizer or pesticides from lawns or golf courses are cited as potential pollution sources.

Assessment and monitoring information on Woodhaven Lake was provided by Lisa Brooks, Aquatic Biologist. Secchi disc depth, total depth and field observations were recorded at three sites (located in Figure 1) on nine dates in 1981.



TABLE 1. LAKE ASSESSMENT SUMMARY, WOODHAVEN LAKE, LEE COUNTY, ILLINOIS (RP-A06-M).

I. GENERAL INFORMATION

River Basin: Rock  
Segment: A06

Ownership: Woodhaven Association, Sublette, IL

Surface Area (Acres): 26.75  
Watershed Area (Acres):  
Maximum Depth (Feet): 30  
Average Depth (Feet): 8  
Storage Capacity (Acre/Feet): 208.61  
Inflowing Stream(s):  
Outflowing Stream(s):  
Water Retention Time:  
Lake Type: dammed stream  
Year Constructed: 1976

II. USAGE

Public Access: No-organization members - guests only.

Lake Usage:

Potable Water Supply: none  
Industrial Water Supply: none  
Agricultural Water Supply: none  
Cooling Water: none  
Recreation:  
Fishing: heavy  
Swimming: very heavy  
Power Boating: none  
Row Boating or Canoeing: heavy  
Sailboating: eight  
Camping: none  
Picnicking: eight  
Waterfowl Hunting: none  
Waterfowl Observation: none  
Other:

Recreational Facilities:  
beach, boat launch

Watershed Usage (Percent):

Urban:  
Residential: 60%  
Golf Courses:  
Pasture or Grassland: 20%  
Woodland: 20%  
Row Crops:  
Wetland:  
Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: good  
Fishing: fair  
Conditions and Extent:  
Suspended Sediment: minimal  
Deposition of Sediment: minimal  
Algal Blooms: slight  
Aquatic Weeds: large  
Taste and/or Odor: minimal  
Water Level Fluctuation: minimal  
Fishkills: minimal  
Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:

Sewage Treatment Plant Effluent:  
Industrial Discharge:  
Urban Storm Drainage:  
Septic Tanks:  
Pasture or Grassland Runoff:  
Cropland Runoff: yes  
Feedlot Runoff:  
Construction Site Runoff:  
Fertilizer or Pesticides from  
Lawns/Golf Courses: yes  
Orchards:  
Forestry Operations Runoff:  
Mining:  
Waterfowl:  
Sediment in Lake:  
Other:

V. LAKE MANAGEMENT

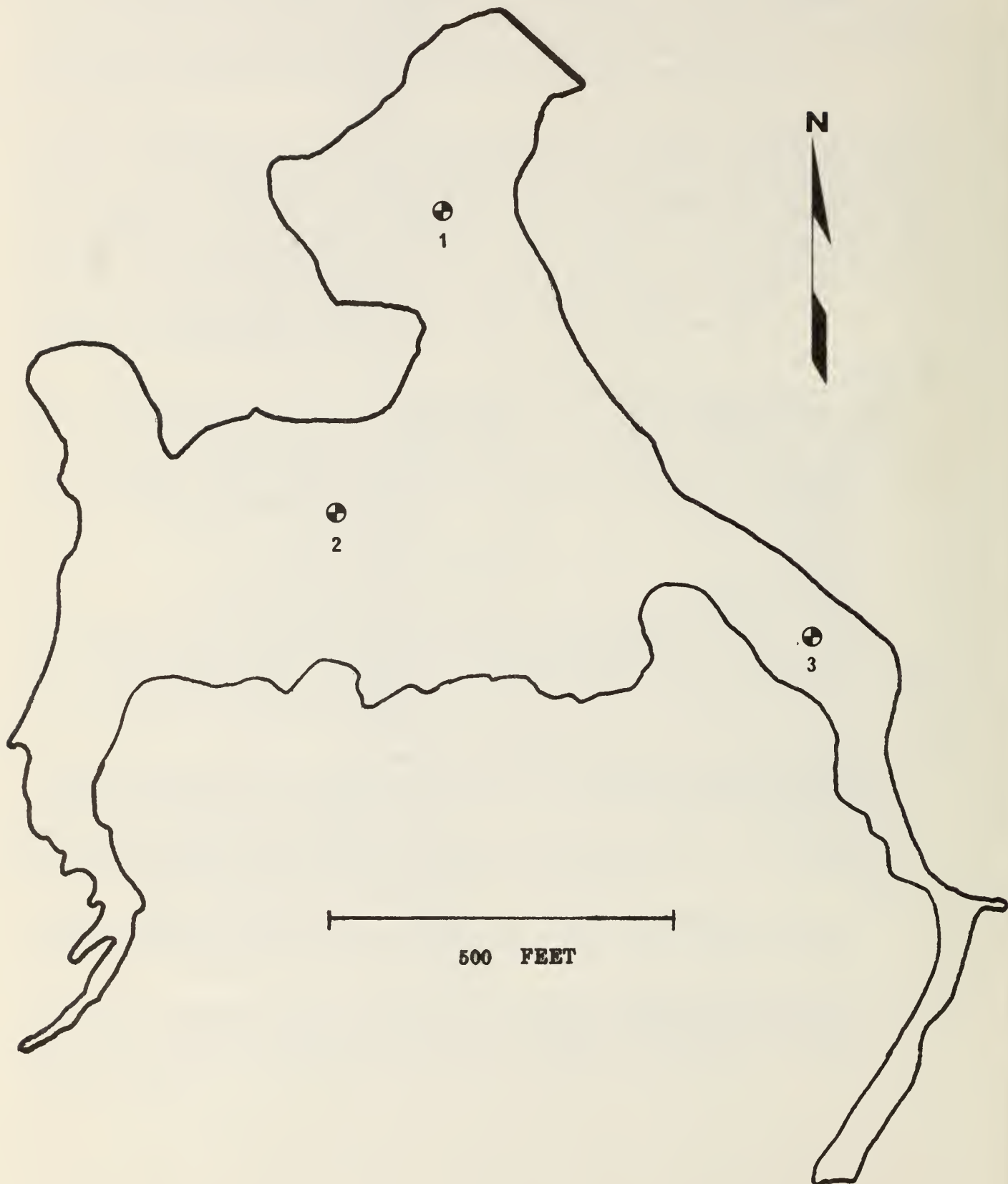
Comments: Fall '79 aerator to prevent winterkill.  
7/80 cutter Harvester Utility Boat for weed harvesting.  
4/81 Antimycin Treatment - elimination of excess bluegill  
Summer 81 Mechanical Harvesting CHUB.  
Summer 81 Stocking of 3"-4" Large Mouth Bass.

Shoreline Usage (Percent):

Urban (Including Streets):  
Residential (Including Lawns): 25%  
Golf Courses:  
Pasture or Grassland: 50%  
Woodland: 25%  
Row Crops:  
Wetland:  
Other:

Information Supplied By Lisa Brooks (1981)

FIGURE 1  
WOODHAVEN LAKE  
LEE COUNTY





## RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report "Volunteer Lake Monitoring, 1981", Section IV "Understanding Illinois' Lakes."

The Secchi monitoring data for Woodhaven Lake are summarized in Table 2 and plotted in Figure 2. Total depth data are provided in Table 3, while field observations are summarized in Table 4.

### Transparency of Woodhaven Lake

The average Secchi disc transparency of Woodhaven Lake was 99.1 inches. It ranked number 3 when the average transparencies of the volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was greater than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976) and was above average for Illinois lakes.

### Spatial and Seasonal Differences in Transparency

The transparency of Woodhaven Lake ranged from a minimum of 24 inches at Site 2 on August 9 to a maximum of 177 inches at Site 1 on May 31.

The clarity of Woodhaven Lake was relatively uniform at the three sites. Transparency averaged 101.3 inches, 96.3 inches and 99.7 inches at Sites 1, 2 and 3, respectively. Secchi readings were greater than the four feet minimum recommended for swimming on seven of the nine sampling dates. Lowest transparencies were recorded in midsummer and were the result of algal blooms and increased amounts of suspended sediment caused by heavy rains which fell a few days before sampling.

Field observations indicate that the transparency of Woodhaven Lake was influenced by both algae and suspended sediment. A greenish-brown water color was observed on most of the sampling dates. Large amounts of aquatic weeds were noted at Sites 2 and 3 on several occasions. Since these sites were not extremely shallow (average depth 12.9 feet at Site 2 and 17.2 feet at Site 3), the heavy weed growth was probably reflective of the high clarity of the lake and nutrient input in the vicinity of those sites. A mechanical weed harvester was used throughout the summer for aquatic weed control.

TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) WOODHAVEN/LEE COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 15	114.0	117.0	141.0	124.0	14.8
05/ 31	177.0	177.0	144.0	146.0	30.0
06/ 30	93.0	105.0	72.0	90.0	16.7
07/ 20	45.0	36.0	36.0	39.0	5.2
08/ 09	45.0	24.0	48.0	39.0	13.1
08/ 22	00.0	00.0	78.0	66.0	6.0
09/ 15	114.0	126.0	130.0	126.0	12.0
10/ 08	114.0	126.0	120.0	120.0	6.0
10/ 20	120.0	126.0	120.0	122.0	3.5

## \*\*\*SUMMARY STATISTICS\*\*\*

SITES	LAKE
MEAN	101.3
STD DEV	40.5
MIN	45.0
MAX	177.0
AV DEPTH	23.4

-1 = missing value

See glossary for explanation of Summary Statistics.

TABLE 3

DEPTH OF SITE (FEET) WOODHAVEN/LEE COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 15	25.0	15.0	18.0	19.3	5.1
05/ 31	25.5	10.5	16.5	17.5	7.5
06/ 30	28.0	15.0	16.5	19.0	7.1
07/ 20	24.0	10.0	16.0	16.7	7.0
08/ 08	26.0	11.0	18.0	18.3	7.5
08/ 22	21.0	14.0	16.0	17.0	3.6
09/ 15	21.0	12.0	18.0	17.0	4.6
10/ 08	10.0	15.0	18.0	17.3	2.1
10/ 20	21.0	14.0	18.0	17.7	3.5

## \*\*\*SUMMARY STATISTICS\*\*\*

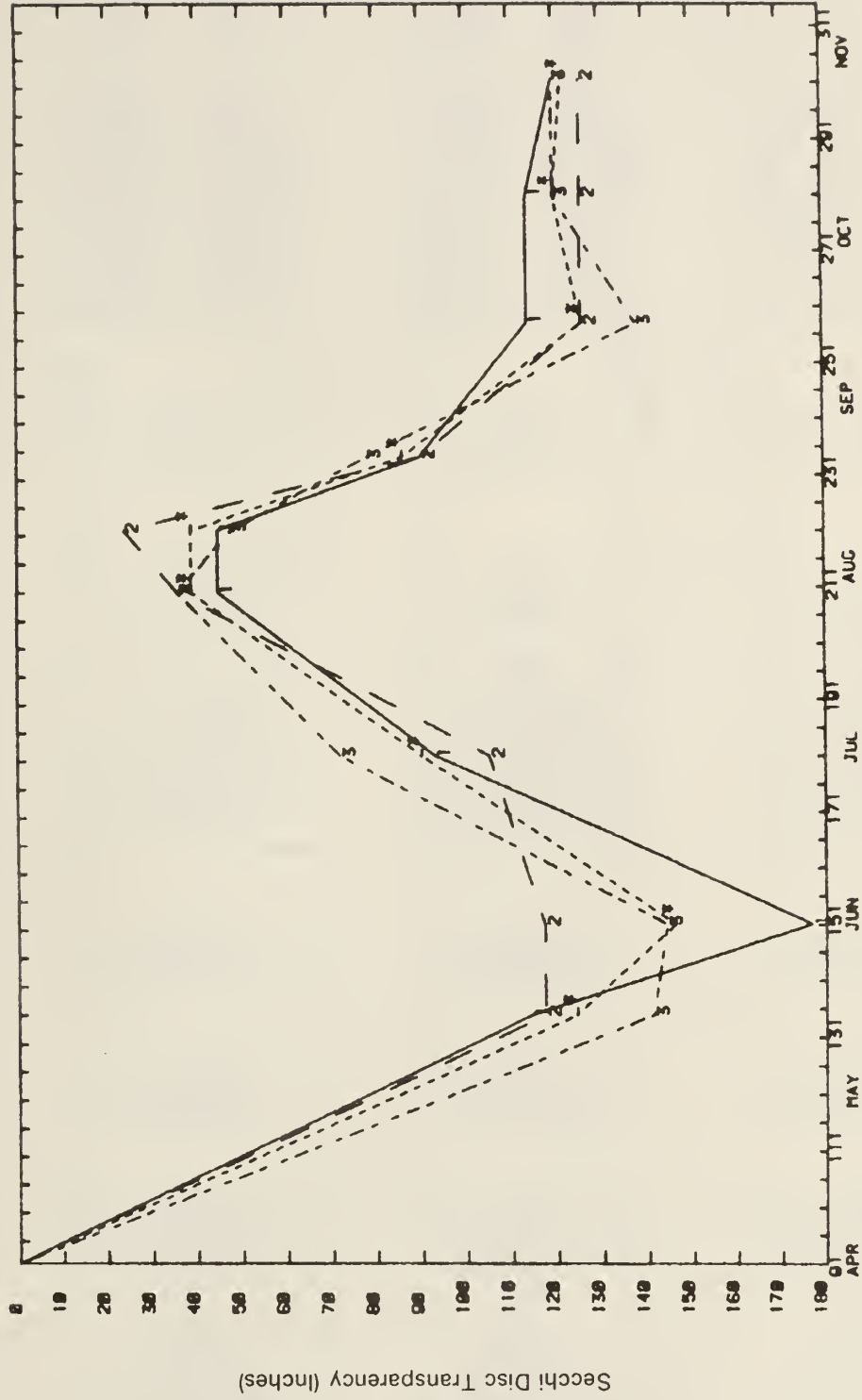
SITES	LAKE
MEAN	23.4
STD DEV	3.0
MIN	10.0
MAX	28.0
AV DEPTH	23.4

-1 = missing value

See glossary for explanation of Summary Statistics.

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) WOODHAVEN/LEE COUNTY, ILLINOIS (VOLUNTEER DATA 1981)



Day of Year

KEY

- 1 Site 1
- 2 Site 2
- 3 Site 3
- . Mean (Average)

TABLE 4 . FIELD OBSERVATIONS, WOODHAVEN LAKE, LEE COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE			WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
5/15/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grnsh-brn slight slight minimal large none no odor	grnsh-brn slight slight minimal large none no odor	grnsh-brn slight slight minimal large none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY: Lisa Brooks	few clouds no rain calm warm N	many clouds heavy rain small cool	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing, row boating/canoeing LAKE MANAGEMENT: ADDITIONAL COMMENTS:
5/31/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	mod. green minimal minimal minimal large none no odor	mod. green minimal minimal moderate large none no odor	mod. green minimal minimal minimal large none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY: Lisa Brooks	clear no rain calm warm	clear no rain calm cool	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing, swimming, row boating/canoeing LAKE MANAGEMENT: 5/22/81 mechanical harvesting of 1/3 of lake for aquatic weeds. ADDITIONAL COMMENTS: Harvesting will be done routinely throughout the summer.
6/30/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grnsh-brn minimal minimal minimal minimal none no odor	grnsh-brn minimal minimal moderate large none no odor	grnsh-brn minimal minimal slight moderate none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY: Lisa Brooks	overcast no rain calm warm	overcast no rain calm warm	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing, swimming, row boating/canoeing LAKE MANAGEMENT: 6/20/81 - present mechanical harvesting of weeds. ADDITIONAL COMMENTS: Nuisance aquatic weeds
7/29/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grn-brn moderate minimal minimal large none no odor	grn-brn moderate minimal minimal large none no odor	grn-brn moderate minimal large none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY: Lisa Brooks	few clouds no rain calm warm	overcast lt. rain ripple cool	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing, swimming, row boating/canoeing LAKE MANAGEMENT: 7/27/81 - present mechanical harvesting of weeds ADDITIONAL COMMENTS:



TABLE 4. FIELD OBSERVATIONS, WOODHAVEN LAKE, LEE COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
8/9/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grn-brn slight minimal moderate none no odor	grn-brn moderate minimal moderate large none no odor	grn-brn moderate minimal large large none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	clear no rain calm warm NE Lisa Brooks	overcast v. lt. rain ripple warm	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing, swimming, row boating/canoeing LAKE MANAGEMENT: 8/1-8/4 mechanical harvesting of weeds ADDITIONAL COMMENTS:
8/22/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grn-brn slight minimal large none no odor	grn-brn slight minimal large none no odor	grn-brn slight minimal minimal large none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	clear no rain calm warm NE Lisa Brooks	clear no rain calm warm	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing, row boating/canoeing LAKE MANAGEMENT: 8/15 - 8/20 removal of aquatic weeds by mechanical harvesting ADDITIONAL COMMENTS: for nuisance aquatic weeds
9/15/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grnsh-brn minimal minimal moderate none no odor	grnsh-brn minimal minimal large none no odor	grnsh-brn minimal minimal large none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	clear no rain calm warm NW Lisa Brooks	few clouds no rain calm warm	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing LAKE MANAGEMENT: none ADDITIONAL COMMENTS:
10/8/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	clear minimal minimal minimal none no odor	clear minimal minimal slight minimal none no odor	clear minimal minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	clear no rain calm warm NW Lisa M. Brooks	clear no rain ripple warm	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: none LAKE MANAGEMENT: none ADDITIONAL COMMENTS:

TABLE 4. FIELD OBSERVATIONS, LAKE WOODHAVEN, LEE COUNTY, ILLINOIS, 1981

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
10/29/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	clear minimal minimal minimal none no odor	clear minimal minimal moderate minimal none no odor	clear minimal minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY: Lisa M. Brooks	clear no rain calm warm S.W	clear no rain calm warm	WATER LEVEL OF LAKE: RECREATIONAL USAGE:  LAKE MANAGEMENT: ADDITIONAL COMMENTS:
DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:				CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:			WATER LEVEL OF LAKE: RECREATIONAL USAGE:  LAKE MANAGEMENT: ADDITIONAL COMMENTS:
DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:				CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:			WATER LEVEL OF LAKE: RECREATIONAL USAGE:  LAKE MANAGEMENT: ADDITIONAL COMMENTS:
DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:				CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:			WATER LEVEL OF LAKE: RECREATIONAL USAGE:  LAKE MANAGEMENT: ADDITIONAL COMMENTS:
DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:				CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:			WATER LEVEL OF LAKE: RECREATIONAL USAGE:  LAKE MANAGEMENT: ADDITIONAL COMMENTS:



## Relationship to Lake Use

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

From the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or oxygenated zone of the lake.

The lower limit of the euphotic zone of Woodhaven Lake (estimated at twice the Secchi depth) ranged from 7.5-29.5 feet at Site 1, from 4.0-21.0 feet at Site 2, from 6.0-24.0 feet at Site 3. Since Woodhaven Lake is deep enough to thermally stratify and had a euphotic zone that was generally less than the total depth, low dissolved oxygen values would be expected in the bottom waters.

In the absence of dissolved oxygen, substances such as hydrogen sulfide, ammonia, methane, phosphorus, iron, and manganese may accumulate in the bottom waters. When these substances are distributed throughout the lake during mixing periods, they can trigger nuisance algal blooms, aquatic weed growth, taste and odor, and other water quality problems.

## SUMMARY AND RECOMMENDATIONS

### Summary

Woodhaven Lake, a small, organizationally owned recreational lake in northern Illinois, was sampled on nine dates between May 1 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteer Lisa Brooks recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Woodhaven Lake (99.1 inches) ranked 3rd of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). This average transparency was greater than the four feet minimum recommended for swimming by the Department of Public Health and was above average for Illinois lakes.

Woodhaven Lake is deep enough to thermally stratify during the summer. Since the lower limit of its euphotic zone (estimated at twice the Secchi depth) was generally less than the total depth, low bottom water dissolved oxygen values, associated water quality problems, and limitation of fish habitat may be expected during summer stratification.

Woodhaven Lake is undergoing the process of eutrophication, as evidenced by transparency readings and field observations of algae, weed, and sediment problems. Protection from further degradation is critical. If nutrient and sediment input were controlled, lake quality would probably improve; failure to control inputs will probably result in continued rapid eutrophication. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

### Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Information on lake water levels is important for determining lake management strategies. Installation of a simple, but accurate, water level measuring device and frequent recording of lake water levels is recommended.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to correct the identified problems.

Installation of Resource Management Systems in source areas of the watershed may reduce nutrient and sediment transport to the lake. Stabilization of the lake shoreline by riprap or some other means may also reduce sediment input. Nutrient contributions from septic tanks, fertilization of lawns, and waterfowl should also be investigated and minimized.

Continuation of the in-lake management program underway is recommended. Aeration-destratification to prevent dissolved oxygen depletion may improve fish habitat and fishing and promote a shift in algal populations to species other than the problem-causing blue-greens. Harvesting of aquatic weeds should be continued.

Consistent data gathered over a period of years is necessary to document and evaluate water quality trends, identify problems, and evaluate lake/watershed management strategies. Therefore, continued monitoring is recommended for Woodhaven Lake.

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DS:jab/sp3873C

## GLOSSARY\*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratification - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.



borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic settleable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen deficiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging through nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and enhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.



mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution emanating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy privileges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

water retention time - water residence time; period of time a mass of water remains in an impoundment.

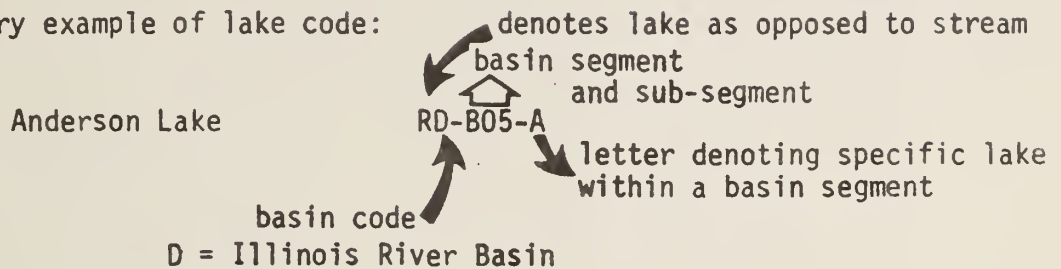
watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

## ABBREVIATIONS AND SYMBOLS

av - average  
brn - brown  
brnsh-grn - brownish-green  
grn-brn - green-brown  
grnsh-brn - greenish-brown  
lt - light  
max - maximum value  
min - minimum value  
mod - moderately  
std. dev. - standard deviation  
v - very

Explanatory example of lake code:



\*Definitions of items in sense used in text

DS:sp,6207a,1-8

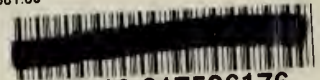








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VOLUNTEER LAKE MONITORING PROGRAM SPRIN  
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Cox. 2

Nat. Hist. Surv

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY  
DIVISION OF WATER POLLUTION CONTROL  
2200 CHURCHILL ROAD  
SPRINGFIELD, ILLINOIS 62706



## 1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT

NATURAL HISTORY SURVEY

AUG 28 1982

1100ADY



Wonder Lake | McHenry Co.



1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT  
FOR  
WONDER LAKE, MCHENRY COUNTY, ILLINOIS

A Cooperative Citizen -  
Illinois Environmental Protection Agency  
Project

May, 1982  
Illinois Environmental Protection Agency  
2200 Churchill Road  
Springfield, Illinois 62706

## TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE</u>
Acknowledgements. . . . .	iii
Introduction. . . . .	1
Background. . . . .	1
Results and Discussion. . . . .	3
Summary and Recommendations . . . . .	10
References. . . . .	12
Glossary. . . . .	13

## LIST OF TABLES

<u>TABLE NO.</u>	<u>PAGE</u>
1. Lake Assessment Summary . . . . .	2
2. Secchi Disc Transparency. . . . .	5
3. Depth of Site . . . . .	5
4. Field Observations. . . . .	7

## LIST OF FIGURES

<u>FIGURE NO.</u>	<u>PAGE</u>
1. Lake Map. . . . .	4
2. Secchi Disc Transparency. . . . .	6



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Assessment and monitoring information was provided by approximately 140 volunteers throughout the state.

Data handling was performed by John Little, Jill Hardin, Marilyn Budd, Lori Whalen, Cora Stockton, and Karen Janssen. Data analyses were performed and tabular and graphical outputs obtained by John Little using programs developed for the Tektronix desk top computer terminal by Dr. David J. Schaeffer and Vladimir Chernomordikov.

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Reports were typed by Word Processing under the direction of Norma Kraus and Diane Woodyard while Field Observations and Lake Assessment Summaries were typed by Betty Pennington, Lori Whalen, Karen Janssen, and Marilyn Budd.

## INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

## BACKGROUND

Wonder Lake is a 730 acre impoundment of Nippersink Creek located in the town of Wonder Lake, McHenry County, Illinois. The lake is owned by Master Property Owners' Association. It has a maximum depth of 13 feet, an average depth of 6.4 feet, and a storage capacity of 4,672 acre-feet (Table 1).

Wonder Lake serves as a recreational lake used primarily for fishing, swimming, powerboating, waterskiing, rowboating, canoeing, and sailboating. Access is limited to property owners and their guests.

The 62,700 acre watershed of Wonder Lake is estimated to be 70 percent primarily rowcrops. The lake shoreline is primarily residential.

Suspended sediment and deposited sediment are considered to be substantial problems for Wonder Lake. Sewage treatment plant effluent, industrial discharge, urban storm drainage, septic tanks, pasture or grassland runoff, cropland runoff, and sediment in the lake are cited as the major pollution sources.

TABLE 1. LAKE ASSESSMENT SUMMARY, WONDER LAKE, MCHENRY COUNTY, ILLINOIS (RT-B01ZC).

I. GENERAL INFORMATION

River Basin: Fox  
Segment: B01

Ownership: Master Property Owner's Association

Surface Area (Acres): 730  
Watershed Area (Acres): 62,720\*  
Maximum Depth (Feet): 13.0  
Average Depth (Feet): 6.4  
Storage Capacity (Acre/Feet): 4672\*  
Inflowing Stream(s): Nippersink Creek  
Outflowing Stream(s): Nippersink Creek  
Water Retention Time: 0.112 years  
Lake Type: Dammed Stream  
Year Constructed: 1925\*

II. USAGE

Public Access: No - Property owners & guests only  
Lake Usage:

Potable Water Supply: none  
Industrial Water Supply: none  
Agricultural Water Supply: none  
Cooling Water: none  
Recreation:  
Fishing: moderate  
Swimming: moderate  
Power Boating: moderate  
Row Boating or Canoeing: moderate  
Sailboating: moderate  
Camping: none  
Picnicking: light  
Waterfowl Hunting: light  
Waterfowl Observation: light  
Other:

Recreational Facilities:  
1 privately owned Marina, 200 more private  
subdivision beaches.

Shoreline Usage (Percent):

Urban (Including Streets):  
Residential (Including Lawns): 75\*  
Golf Courses:  
Pasture or Grassland:  
Woodland: 10\*  
Row Crops:  
Wetland: 15\*  
Other:

Watershed Usage (Percent):

Urban:  
Residential: 10\*  
Golf Courses:  
Pasture or Grassland: 10\*  
Woodland: 5\*  
Row Crops: 70\*  
Wetland: 5\*  
Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: fair  
Fishing: fair

Conditions and Extent:

Suspended Sediment: large  
Deposition of Sediment: large  
Algal Blooms: slight\*  
Aquatic Weeds: moderate  
Taste and/or Odor:  
Water Level Fluctuation:  
Fishkills:  
Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:

Sewage Treatment Plant Effluent: yes  
Industrial Discharge: yes  
Urban Storm Drainage: yes  
Septic Tanks: yes  
Pasture or Grassland Runoff: yes  
Cropland Runoff: yes  
Feedlot Runoff:  
Construction Site Runoff:  
Fertilizer or Pesticides from  
Lawns/Golf Courses:  
Orchards:  
Forestry Operations Runoff:  
Mining:  
Waterfowl:  
Sediment in Lake: yes  
Other:

V. LAKE MANAGEMENT

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Information Supplied By Joanne L. Heinly (1981); \*Illinois Department of Conservation (1977).

Assessment information on Wonder Lake was provided by Joanne L. Heinly and the Illinois Department of Conservation. Monitoring was performed by Joanne Heinly, Juanita Seabaugh and Jack Crawford. Secchi disc depth, total depth and field observations were recorded at three sites (located in Figure 1) on ten dates in 1981.

## RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report "Volunteer Lake Monitoring, 1981", Section IV "Understanding Illinois' Lakes."

The Secchi monitoring data for Wonder Lake are summarized in Table 2 and plotted in Figure 2. Total depth data are provided in Table 3, while field observations are summarized in Table 4.

### Transparency of Wonder Lake

The average Secchi disc transparency of Wonder Lake was 13.6 inches, which ranked number 74 when the average transparencies of the volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976) and was in the range generally associated with use impairment problems in Illinois lakes.

### Spatial and Seasonal Differences in Transparency

The Secchi disc transparency of Wonder Lake ranged from a minimum of 10 inches at Site 3 on June 30, July 17 and 30, August 14 and 30 to a maximum of 24 inches at Site 1 on October 10. Secchi readings were below the four feet minimum recommended for swimming on all sampling dates.

Transparency averaged 14.4 inches at Sites 1 and 2, and 12.0 inches at Site 3. The brown water color observed during the survey indicates that the lack of transparency was due primarily to suspended sediment.

A spatial trend of increasing transparency from the lake headwaters to the dam, as is typical of most Illinois reservoirs, was not apparent in Wonder Lake. The shallow nature of the sites (average depths 11.3 feet at Site 1, 6.4 feet at Site 2 and 5.8 feet at Site 3), allows wind and wave activity to stir up the sediment. Another factor affecting transparency may be the short water retention time of 41 days. Short retention time keeps the suspended sediment from settling out in the upper end of the lake.



**FIGURE 1**  
**WONDER LAKE**  
**MCHENRY COUNTY**





TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) WONDER/MCHENRY COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
06/ 26	12.0	14.0	14.0	13.3	1.2
06/ 12	12.0	14.0	14.0	13.3	1.2
06/ 30	12.0	12.0	10.0	11.3	1.2
07/ 17	12.0	12.0	10.0	11.3	1.2
07/ 30	12.0	12.0	10.0	11.3	1.2
08/ 14	12.0	12.0	10.0	11.3	1.2
08/ 30	12.0	12.0	10.0	11.3	1.2
09/ 15	18.0	18.0	14.0	16.7	2.3
09/ 30	18.0	18.0	14.0	16.7	2.3
10/ 10	24.0	20.0	14.0	19.3	5.0

\*\*\*SUMMARY STATISTICS\*\*\*

LAKE

SITES	MEAN	STD DEV	MIN	MAX	AV DEPTH
	14.4	4.2	12.0	24.0	11.3
	14.4	3.1	12.0	20.0	6.4
	12.0	2.1	10.0	14.0	5.8
	13.6	3.3	10.0	24.0	

-1 = missing value

See glossary for explanation of Summary Statistics.

TABLE 3

DEPTH OF SITE (FEET) WONDER/MCHENRY COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 26	11.0	6.5	6.0	7.8	2.0
06/ 12	11.0	6.5	6.0	7.8	2.0
06/ 30	11.0	6.0	5.5	7.5	3.0
07/ 17	11.0	6.0	5.5	7.5	3.0
07/ 30	11.0	6.0	5.5	7.5	3.0
08/ 14	11.0	6.0	5.5	7.5	3.0
08/ 30	11.0	6.0	5.5	7.5	3.0
09/ 15	11.5	7.0	6.0	8.2	2.0
09/ 30	11.5	7.0	6.0	8.2	2.0
10/ 10	12.5	6.5	6.0	8.3	3.6

\*\*\*SUMMARY STATISTICS\*\*\*

LAKE

SITES	MEAN	STD DEV	MIN	MAX	AV DEPTH
	11.3	0.5	11.0	12.5	
	6.4	0.4	6.0	7.0	
	6.4	0.3	5.5	6.0	
	5.8	0.3	5.5	6.0	
	8.3	3.6	6.0	12.5	

-1 = missing value

See glossary for explanation of Summary Statistics.

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) VONDER/HENRY COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

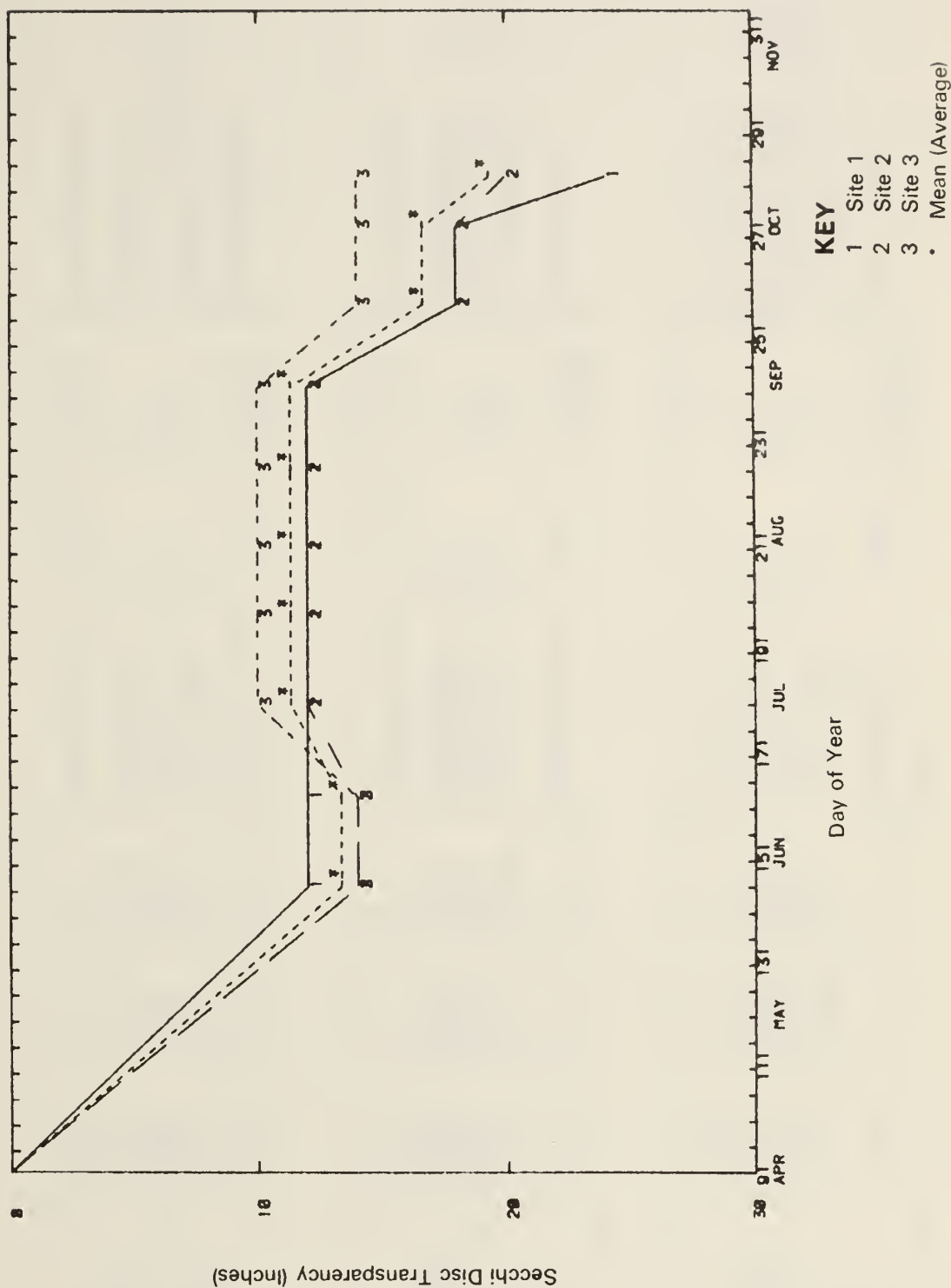


TABLE 4. FIELD OBSERVATIONS, LAKE WONDER, MCHENRY COUNTY, ILLINOIS, 1981

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
5/26/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown minimal minimal minimal minimal aquatic insects no odor	lt. brown minimal minimal minimal minimal water fowl no odor	lt. brown minimal minimal minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds no rain calm cool N.E.	few clouds no rain calm cool N.E.	WATER LEVEL OF LAKE: above normal 6" RECREATIONAL USAGE: fishing, power boating, row boating/canoeing, sailing LAKE MANAGEMENT: ADDITIONAL COMMENTS:
6/12/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown minimal minimal minimal minimal aquatic weeds no odor	lt. brown minimal minimal minimal minimal none no odor	lt. brown minimal minimal minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds no rain calm cool S.W.	few clouds mod. rain small cool S.	WATER LEVEL OF LAKE: above normal 4" RECREATIONAL USAGE: fishing, swimming, water-skiing, power boating, sailing, row boating/canoeing LAKE MANAGEMENT: ADDITIONAL COMMENTS:
7/17/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown minimal minimal minimal minimal aquatic weeds no odor	lt. brown minimal minimal minimal minimal water fowl no odor	lt. brown minimal minimal minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	many clouds no rain calm warm S.W.	few clouds no rain calm warm S.W.	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: power boating, water skiing, row boating/canoeing LAKE MANAGEMENT: ADDITIONAL COMMENTS:
7/17/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown minimal minimal minimal minimal aquatic insects no odor	lt. brown minimal minimal minimal minimal none no odor	lt. brown minimal minimal minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	overcast v.lt. rain ripple warm S.W.	overcast mod. rain moderate warm S.W.	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: power boating, water skiing, row boating/canoeing, sailing LAKE MANAGEMENT: ADDITIONAL COMMENTS:

TABLE 4. FIELD OBSERVATIONS, LAKE WONDER, MCHENNY COUNTY, ILLINOIS, 1981

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
7/30/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown minimal minimal minimal minimal none no odor	lt. brown minimal minimal minimal minimal water fowl no odor	lt. brown minimal minimal minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain calm hot N.E.	clear no rain calm hot N.E.	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: power boating, water-skiing  LAKE MANAGEMENT:  ADDITIONAL COMMENTS:
8/14/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown minimal minimal minimal minimal none no odor	lt. brown minimal minimal minimal minimal water fowl no odor	lt. brown minimal minimal minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	hazy no rain calm hot S.W.	hazy v.l.t. rain ripple hot S.W.	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: power boating, water-skiing, row boating/canoeing, sailing  LAKE MANAGEMENT:  ADDITIONAL COMMENTS:
8/30/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn slight minimal minimal minimal none no odor	brnsh-grn slight minimal minimal minimal none no odor	brnsh-grn slight minimal minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	many clouds no rain calm warm S.W.	few clouds no rain ripple warm S.W.	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: swimming, water-skiing, sailing, row boating/canoeing  LAKE MANAGEMENT:  ADDITIONAL COMMENTS:
9/15/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn minimal minimal minimal minimal none no odor	brnsh-grn minimal minimal minimal minimal none no odor	brnsh-grn minimal minimal minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain calm cool S.W.	overcast heavy rain white caps cool S.W.	WATER LEVEL OF LAKE: above normal 6" RECREATIONAL USAGE: power boating, water-skiing, sailing  LAKE MANAGEMENT:  ADDITIONAL COMMENTS:



TABLE 4. FIELD OBSERVATIONS, LAKE WONDER, MCHENRY COUNTY, ILLINOIS, 1981

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
9/30/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn slight minimal minimal minimal none no odor	brnsh-grn slight minimal minimal minimal none no odor	brnsh-grn slight minimal minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain ripple warm N.E.	clear no rain ripple warm N.E.	WATER LEVEL OF LAKE: above normal 6" RECREATIONAL USAGE: fishing, power boating, row boating/canoeing & sailing LAKE MANAGEMENT: ADDITIONAL COMMENTS:
OBSERVATIONS MADE BY: Joanne L. Heinly & Jack Crawford & Nita Seabaugh								
DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
10/10/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn slight minimal minimal minimal none no odor	brnsh-grn slight minimal minimal minimal none no odor	brnsh-grn slight minimal minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:			WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:
OBSERVATIONS MADE BY:								
DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:				CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:			WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:
OBSERVATIONS MADE BY:								
DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:				CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:			WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:
OBSERVATIONS MADE BY:								



## Relationship to Lake Use

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Wonder Lake (estimated at twice the Secchi depth) ranged from 2.0-4.0 feet at Site 1, from 2.0-3.3 feet at Site 2, from 1.7-2.3 feet at Site 3. Since Site 1 on Wonder Lake is deep enough to thermally stratify and has a euphotic zone which was generally less than the total depth, low dissolved oxygen may be expected in the bottom waters of this site.

In the absence of dissolved oxygen, undesirable substances such as hydrogen sulfide, ammonia, methane, phosphorus, iron, and manganese may accumulate in the bottom waters. When these substances are distributed throughout the lake during mixing periods, they can trigger nuisance algal blooms, aquatic weed growth, taste and odor, and other water quality problems.

## SUMMARY AND RECOMMENDATIONS

### Summary

Wonder Lake, a large shallow, recreational impoundment in northeastern Illinois, was sampled on ten dates between May 1 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteers Joanne Heinly, Juanita Seabaugh, and Jack Crawford recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Wonder Lake (13.6 inches) ranked 74th of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). This average transparency was less than the four feet minimum recommended for swimming by the Department of Public Health and was in the range generally associated with use impairment problems in Illinois lakes.

Site 1 on Wonder Lake is deep enough to thermally stratify during the summer. Since the lower Limit of its euphotic zone (estimated as twice the Secchi depth) is generally less than the total depth, low bottom water dissolved oxygen values, associated water quality problems, and limitation of fish habitat may be expected during summer stratification.

Wonder Lake is undergoing the process of eutrophication, as evidenced by transparency readings and field observations of algae, weed, and sediment problems. Protection from further degradation is critical. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

### Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Information on lake water levels is important for determining lake management strategies. Installation of a simple, but accurate, water level measuring device and frequent recording of lake water levels is recommended.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to correct the identified problems.

Installation of Resource Management Systems in source areas of the watershed may reduce nutrient and sediment transport to the lake. Stabilization of the lake shoreline by riprap or some other means may also reduce sediment input. Nutrient contributions from sewage effluent, septic tanks, fertilization of lawns, and waterfowl should also be investigated and minimized.

In-lake management may also warrant consideration. Aeration-destratification to prevent dissolved oxygen depletion may promote a shift in algal populations to species other than the problem-causing blue-greens and improve fishing.

Continued monitoring is recommended for Wonder Lake. Consistent data gathered over a period of years is necessary to document and evaluate water quality trends, identify problems, and evaluate lake/watershed management strategies.

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Illinois Department of Conservation. 1977. Illinois Inland Lakes Problems Assessment Data Form, filled out for Illinois Environmental Protection Agency, "Assessment and Classification of Illinois Lakes."

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Illinois Environmental Protection Agency. 1982. Volunteer Lake Monitoring, 1981. A Cooperative Citizen - Illinois Environmental Protection Agency project. Monitoring Unit; Division of Water Pollution Control, Illinois EPA, Springfield, Illinois.

Illinois State Water Survey. 1924-1981. Lake Sedimentation Surveys. Hydrology Section, Illinois State Water Survey, Urbana, Illinois.

DS:jab/sp3891C

## GLOSSARY\*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratification - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.



borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic settleable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen deficiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging through nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.



green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and enhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution emanating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy privileges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.



suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

water retention time - water residence time; period of time a mass of water remains in an impoundment.

watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

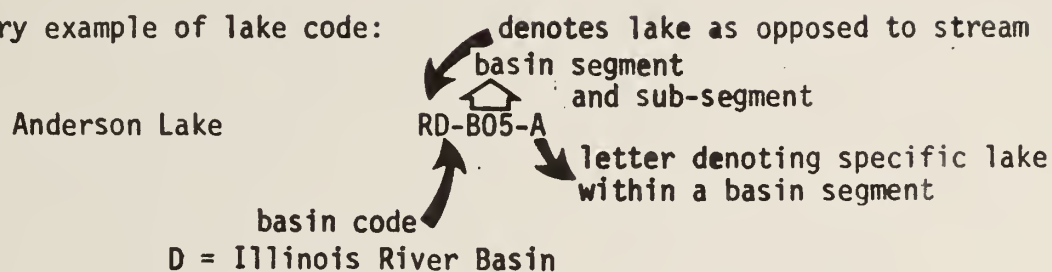
zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.



## ABBREVIATIONS AND SYMBOLS

av - average  
brn - brown  
brnsh-grn - brownish-green  
grn-brn - green-brown  
grnsh-brn - greenish-brown  
lt - light  
max - maximum value  
min - minimum value  
mod - moderately  
std. dev. - standard deviation  
v - very

Explanatory example of lake code:



\*Definitions of items in sense used in text

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Nat. Hist. Serv.

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY  
 DIVISION OF WATER POLLUTION CONTROL  
 2200 CHURCHILL ROAD  
 SPRINGFIELD, ILLINOIS 62706



## 1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT

NATURAL HIST. SURVEY  
 AUG 2, 1982  
 IRDADV



WAVERLY CITY LAKE / MORGAN CO.





1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT  
FOR  
WAVERLY LAKE, MORGAN COUNTY, ILLINOIS

A Cooperative Citizen-  
Illinois Environmental Protection Agency  
Project

May, 1982  
Illinois Environmental Protection Agency  
2200 Churchill Road  
Springfield, Illinois 62706

## TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE</u>
Acknowledgements. . . . .	iii
Introduction. . . . .	1
Background. . . . .	1
Results and Discussion. . . . .	4
Summary and Recommendations . . . . .	10
References. . . . .	12
Glossary. . . . .	13

## LIST OF TABLES

<u>TABLE NO.</u>	<u>PAGE</u>
1. Lake Assessment Summary . . . . .	2
2. Secchi Disc Transparency. . . . .	5
3. Depth of Site . . . . .	5
4. Field Observations. . . . .	7

## LIST OF FIGURES

<u>FIGURE NO.</u>	<u>PAGE</u>
1. Lake Map. . . . .	3
2. Secchi Disc Transparency. . . . .	6

## ACKNOWLEDGEMENTS

This is one of 87 reports prepared for lakes in the 1981 Volunteer Lake Monitoring Program. It represents the coordinated effort of many individuals.

Illinois EPA's Ambient Monitoring Unit, Planning Section, Division of Water Pollution Control, under the direction of Kenneth R. Rogers, was responsible for the design and implementation of the program, as well as preparation of this report. Substantial assistance was provided by the Agency's Public Participation Section supervised by Gloria Craven.

Program coordination was provided by Donna Sefton for the Illinois EPA's Ambient Monitoring Unit and Carol Beim for the Public Participation Section.

Volunteers were trained by Public Participation Coordinators Carol Beim, Bob Hagele, William Hammel, Patrick McCarthy, Vanessa Musgrave, and Dawn Wrobel. Lake maps were prepared by J. W. Hammel and Bob Hagele. Lake assessment summaries were prepared by Patrick McCarthy.

Assessment and monitoring information was provided by approximately 140 volunteers throughout the state.

Data handling was performed by John Little, Jill Hardin, Marilyn Budd, Lori Whalen, Cora Stockton, and Karen Janssen. Data analyses were performed and tabular and graphical outputs obtained by John Little using programs developed for the Tektronix desk top computer terminal by Dr. David J. Schaeffer and Vladimir Chernomordikov.

Donna Sefton, Howard Essig, John Little, John Lesnak, Carol Beim, and Bob Hagele wrote portions of the lake reports. Reports were edited by Planning Section and Public Participation staff, particularly Marilyn Budd and Mary Anderson. The contributions of Robert Clarke and Thomas Davenport are recognized.

Reports were typed by Word Processing under the direction of Norma Kraus and Diane Woodyard while Field Observations and Lake Assessment Summaries were typed by Betty Pennington, Lori Whalen, Karen Janssen, and Marilyn Budd.

## INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. Sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled, "Volunteer Lake Monitoring, 1981" summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

## BACKGROUND

Waverly Lake is a 59 acre impoundment owned by the City of Waverly, Morgan County, Illinois. The lake, which was constructed by damming Woods Creek in 1938, has a maximum depth of 12 feet, an average depth of 6 feet and a storage capacity of 354 acre-feet (Table 1).

Waverly Lake serves as a potable water supply for the City. The primary recreational use associated with the lake is fishing. Access is free and unlimited.

The 5,914 acre watershed of Waverly Lake is estimated to be 75 percent row crops. The shoreline is primarily pasture or grassland.

Deposition of sediment is considered a substantial problem, while suspended sediment and algal blooms are considered moderate problems for Waverly Lake. Cropland runoff and feedlot runoff are cited as major pollution sources.

Assessment information for Waverly Lake was provided by Maurice L. Mitchell, the Water Treatment Plant Operator. Monitoring was performed by James Watts and Stanley Eyer. Secchi disc transparency, total depth, and field observations were recorded at three sites (located in Fig. 1) on twelve dates in 1981: May 13 and 28, June 15 and 26, July 13 and 31, August 14 and 31, September 14 and 29, and October 13 and 26.



TABLE 1. LAKE ASSESSMENT SUMMARY, WAVERLY LAKE, MORGAN COUNTY, ILLINOIS (SD-B06-C).

I. GENERAL INFORMATION

River Basin: Illiroidis  
Segment: B06

Ownership: City of Waverly

Surface Area (Acres): 59  
Watershed Area (Acres): 5914  
Maximum Depth (Feet): 12  
Average Depth (Feet): 6  
Storage Capacity (Acre/Feet): 354  
Inflowing Stream(s): Woods Creek  
Outflowing Stream(s): Woods Creek  
Water Retention Time: 0.067 years  
Lake Type: dammed stream  
Year Constructed: 1938

II. USAGE

Public Access: yes  
Lake Usage:  
Potable Water Supply: moderate  
Industrial Water Supply: none  
Agricultural Water Supply: none  
Cooling Water: none  
Recreation:  
Fishing: moderate  
Swimming: none  
Power Boating: none  
Row Boating or Canoeing: none  
Sailboating: none  
Camping: none  
Picnicking: light  
Waterfowl Hunting: light  
Waterfowl Observation: none  
Other:

Recreational Facilities:  
boat docks

Shoreline Usage (Percent):  
Urban (Including Streets):  
Residential (Including Lawns): 2  
Golf Courses:  
Pasture or Grassland: 98  
Woodland:  
Row Crops:  
Wetland:  
Other:

Watershed Usage (Percent):

Urban:  
Residential:  
Golf Courses:  
Pasture or Grassland: 25  
Woodland:  
Row Crops: 75  
Wetland:  
Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: fair  
Fishing: fair  
Conditions and Extent:  
Suspended Sediment: moderate  
Deposition of Sediment: large  
Algal Blooms: moderate  
Aquatic Weeds: minimal  
Taste and/or Odor: minimal  
Water Level Fluctuation: minimal  
Fishkills: minimal  
Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:  
Sewage Treatment Plant Effluent:  
Industrial Discharge:  
Urban Storm Drainage:  
Septic Tanks:  
Pasture or Grassland Runoff:  
Cropland Runoff: yes  
Feedlot Runoff: yes  
Construction Site Runoff:  
Fertilizer or Pesticides from  
Lawns/Golf Courses:  
Orchards:  
Forestry Operations Runoff:  
Mining:  
Waterfowl:  
Sediment in Lake:  
Other:

V. LAKE MANAGEMENT

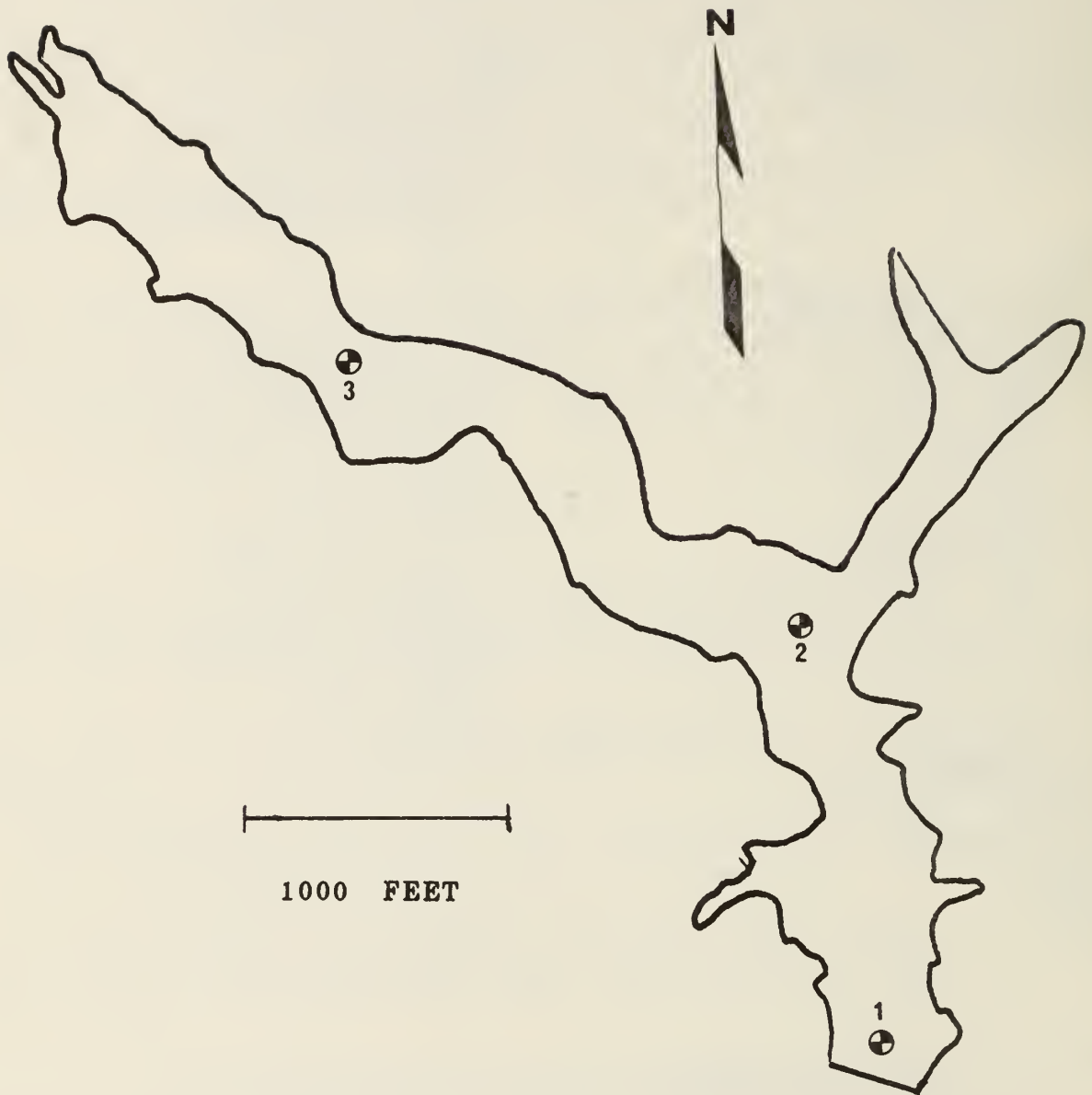
Comments: 500 lbs. of copper sulfate monthly.

Information Supplied By Maurice Mitchell (1981)

FIGURE 1

WAVERLY LAKE

MORGAN COUNTY



## RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report, "Volunteer Lake Monitoring, 1981", Section IV, "Understanding Illinois' Lakes."

The Secchi monitoring data for Waverly Lake was summarized in Table 2 and plotted in Fig. 2. Total depth data are provided in Table 3, while field observations are summarized in Table 4.

### Transparency of Waverly Lake

The average Secchi disc transparency of Waverly Lake was 10.8 inches, which ranked number 78 when the average transparencies of the volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976), and in the range generally associated with use impairment problems in Illinois lakes. However, above normal rainfall during the sampling period may have contributed to a lower than normal transparency.

### Spatial and Seasonal Differences in Transparency

The Secchi disc transparency of Waverly Lake ranged from a minimum of 2 inches at Site 3 on June 15 to a maximum of 24 inches at Sites 1 and 3 on July 13 and May 28, respectively.

Clarity was relatively uniform at the three sites on Waverly Lake. Transparencies averaged 11.8 inches, 10.7 inches and 9.8 inches at Sites 1, 2, and 3, respectively. The fact that the Secchi readings did not significantly increase from the lake headwaters to the dam, as is typical of most Illinois reservoirs, can probably be attributed to the very short water retention time of 0.067 years (24 days) and the shallowness of the lake. The short water retention time and disturbance of bottom sediments by wind and wave activity would prevent the sediment load from settling out in the upper end of the lake; therefore, the water would not become clearer towards the dam. This is supported by the field observations of water color and amounts of algae and suspended sediment present, which were generally the same at all three sites throughout the survey.

The lake was extremely turbid throughout the May-October sampling. Field observations indicate that the lack of transparency was primarily due to the presence of suspended sediment. However, algae is also considered a problem, since the lake is routinely treated with copper sulfate.

TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) WAVERLY/MORGAN COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 13	4.0	4.0	4.0	4.0	0.0
05/ 28	20.0	22.0	24.0	22.0	2.0
06/ 15	6.0	4.0	2.0	4.0	2.0
06/ 26	8.0	8.0	6.0	7.3	1.2
07/ 13	24.0	16.0	12.0	17.3	6.1
07/ 31	8.0	8.0	6.0	7.3	1.2
08/ 14	6.0	8.0	10.0	8.0	2.0
08/ 31	14.0	12.0	12.0	12.7	1.2
09/ 14	13.0	12.0	10.0	11.7	1.5
09/ 29	11.0	8.0	6.0	8.3	2.5
10/ 13	12.0	12.0	11.0	11.7	0.6
10/ 26	16.0	14.0	14.0	14.7	1.2

\*\*\*SUMMARY STATISTICS\*\*\*

SITES	LAKE
MEAN	11.8
STD DEV	6.0
MIN	4.0
MAX	24.0
AV DEPTH	10.7

-1 = missing value

See glossary for explanation of Summary Statistics.

TABLE 3

DEPTH OF SITE (FEET) WAVERLY/MORGAN COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 13	10.5	8.5	5.5	8.2	2.5
05/ 28	11.0	8.0	5.0	8.0	3.0
06/ 15	11.0	8.5	5.5	8.3	2.8
06/ 26	10.0	9.0	6.0	8.3	2.1
07/ 13	11.0	8.5	5.5	8.3	2.8
07/ 31	10.5	8.5	5.5	8.2	2.5
08/ 14	10.5	9.5	5.5	8.5	2.5
08/ 31	10.5	8.0	5.5	8.0	2.5
09/ 14	10.5	8.0	5.5	8.0	2.5
09/ 29	11.0	8.5	6.0	8.5	2.5
10/ 13	10.5	6.0	5.0	7.2	2.0
10/ 26	11.0	6.0	5.5	7.5	3.0

\*\*\*SUMMARY STATISTICS\*\*\*

SITES	LAKE
MEAN	10.7
STD DEV	0.3
MIN	10.0
MAX	11.0
AV DEPTH	10.7

-1 = missing value

See glossary for explanation of Summary Statistics.

# FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) WAVERLY/MORGAN COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

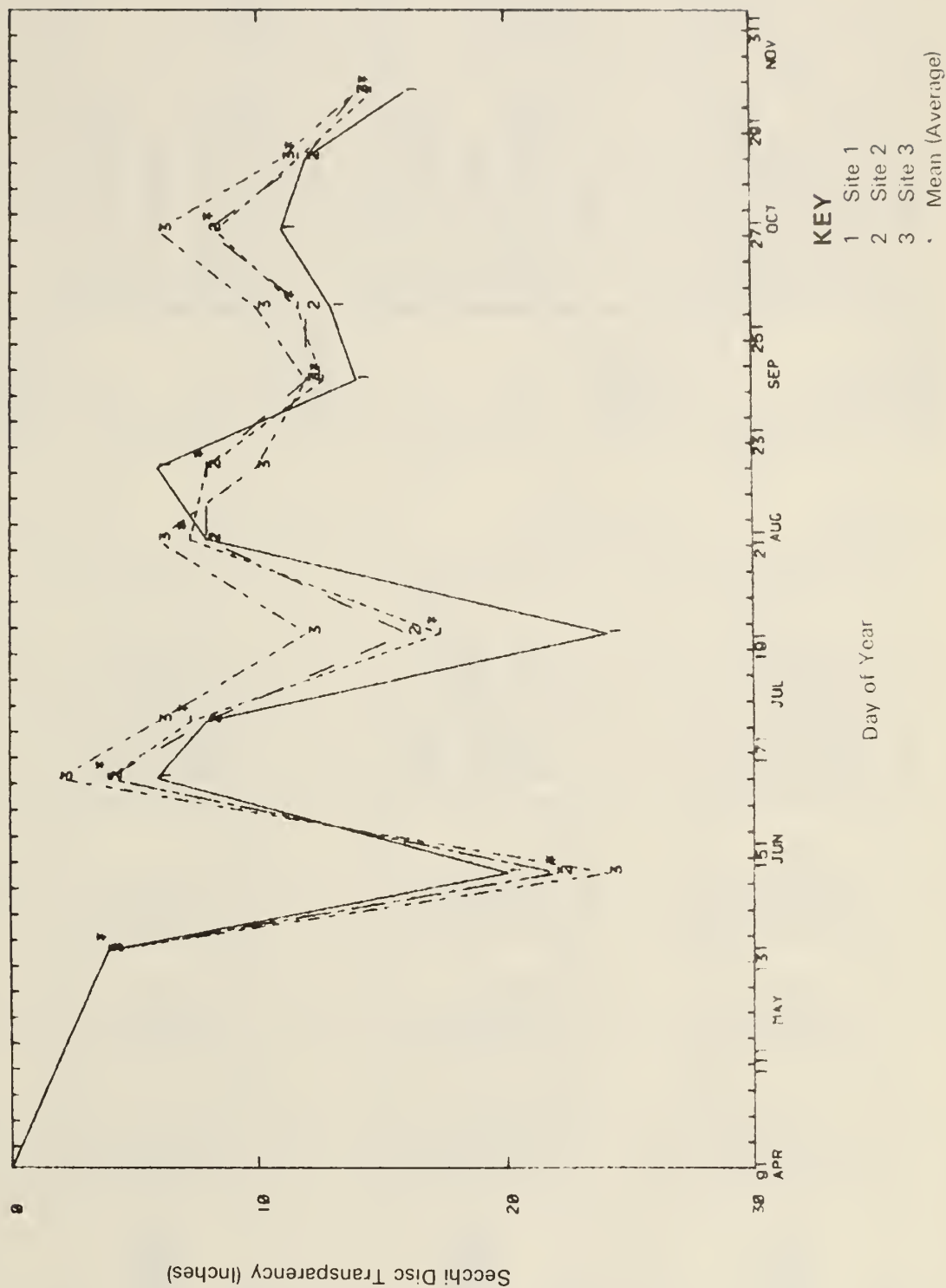




TABLE 4. FIELD OBSERVATIONS, WAVERLY LAKE, MORGAN COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
5/13/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	mod. brown large minimal minimal minimal none no odor	mod. brown large minimal minimal minimal refuse no odor	mod. brown large slight minimal slight refuse no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	overcast no rain ripple cool NW	overcast no rain small warm NW	WATER LEVEL OF LAKE: RECREATIONAL USAGE:  LAKE MANAGEMENT: 4/16/81 500 lbs. copper sulfate ADDITIONAL COMMENTS: algae control
					OBSERVATIONS MADE BY: James Watts			
DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
5/28/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. green minimal minimal minimal minimal none no odor	lt. green minimal minimal minimal slight none no odor	lt. green minimal minimal minimal moderate none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds no rain calm hot SW	many clouds no rain small hot S	WATER LEVEL OF LAKE: $\frac{1}{2}$ over & spilling RECREATIONAL USAGE: fishing, power boating, row boating/canoeing LAKE MANAGEMENT: no treatment ADDITIONAL COMMENTS:
					OBSERVATIONS MADE BY: James Watts			
DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
6/15/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown moderate minimal minimal slight none no odor	lt. brown moderate minimal minimal moderate none no odor	lt. brown moderate minimal minimal slight none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds no rain small warm NW	overcast lt. rain ripple hot SE	WATER LEVEL OF LAKE: 1" & spilling RECREATIONAL USAGE: fishing, power boating LAKE MANAGEMENT: ADDITIONAL COMMENTS:
					OBSERVATIONS MADE BY: James Watts Stanley Eyer			
DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
6/26/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. green minimal minimal minimal minimal none no odor	lt. green minimal minimal minimal minimal none no odor	lt. green minimal minimal minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain ripple warm W	clear no rain ripple warm S	WATER LEVEL OF LAKE: 2" overflow RECREATIONAL USAGE: none LAKE MANAGEMENT: none ADDITIONAL COMMENTS:
					OBSERVATIONS MADE BY:			

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
7/13/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. green minimal minimal slight refuse no odor	lt. green minimal minimal minimal none no odor	lt. green minimal minimal slight none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain ripple hot S	clear no rain calm hot E	spilling above normal 1/2" none  LAKE MANAGEMENT: 7/2/81 copper sulfate ADDITIONAL COMMENTS: algae control

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
7/31/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn minimal minimal minimal none no odor	lt. brown minimal minimal minimal none no odor	lt. brown minimal minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain ripple warm S	few clouds no rain ripple warm SW	spilling   LAKE MANAGEMENT: ADDITIONAL COMMENTS:

100

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
8/19/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown slight minimal minimal none no odor	lt. brown slight minimal minimal slight detritus duckweed no odor	lt. brown slight minimal minimal slight none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds no rain small warm	clear no rain ripple warm	above normal 1" none  LAKE MANAGEMENT: 8/6/81 500# ADDITIONAL COMMENTS: for algae

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
9/14/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown minimal minimal slight none fishy	brnsh-grn minimal slight minimal slight none fishy	brnsh-grn minimal slight moderate algal mats fishy	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	hazy no rain small warm S	few clouds v. lt. rain moderate warm S	below normal 1" power boating, fishing, camping  LAKE MANAGEMENT: 9/14/81 500# ADDITIONAL COMMENTS: copper sulfate for algae

TABLE 4. FIELD OBSERVATIONS, WAVERLY LAKE, MORGAN COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
8/31/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	mod. brown slight minimal minimal minimal detritus no odor	vry. brown slight minimal minimal minimal detritus no odor	vry. brown slight minimal moderate detritus no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain ripple warm S	many clouds moderate small warm SE	WATER LEVEL OF LAKE: above normal 1" RECREATIONAL USAGE: none  LAKE MANAGEMENT:  ADDITIONAL COMMENTS:
OBSERVATIONS MADE BY: James L. Watts								
DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
9/29/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown slight minimal minimal minimal none no odor	lt. brown slight minimal minimal slight none no odor	lt. brown slight minimal minimal slight none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain small warm S	few clouds no rain calm warm S	WATER LEVEL OF LAKE: 2" below normal RECREATIONAL USAGE: fishing, power boating  LAKE MANAGEMENT:  ADDITIONAL COMMENTS:
OBSERVATIONS MADE BY: James Watts								
DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
10/13/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown minimal minimal minimal minimal none no odor	lt. brown minimal minimal minimal minimal none no odor	lt. brown slight minimal minimal slight none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds v.lt. rain ripple cool N.	few clouds no rain small cool N.	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: none  LAKE MANAGEMENT: none  ADDITIONAL COMMENTS:
OBSERVATIONS MADE BY: James L. Watts								
DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
10/26/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown slight minimal minimal slight none no odor	mod. brown moderate minimal minimal slight none no odor	mod. brown moderate minimal minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	overcast v.lt. rain ripple cool N.W.	few clouds no rain calm warm E.	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: none  LAKE MANAGEMENT:  ADDITIONAL COMMENTS: full
OBSERVATIONS MADE BY: James L. Watts								



## Relationship to Lake Use

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Waverly Lake (estimated at twice the Secchi depth) ranged from 0.7-4.0 feet at Site 1, 0.7-3.7 feet at Site 2, and 0.3-4.0 feet at Site 3. Since Site 1 is deep enough to thermally stratify and had a euphotic zone less than the total depth, low dissolved oxygen values may be expected in the bottom waters.

In the absence of dissolved oxygen, substances such as hydrogen sulfide, ammonia, methane, phosphorus, iron, and manganese may accumulate in the bottom waters. These substances can contribute to serious taste and odor problems in drinking water if water supply is taken from near the lake bottom during summer stratification. When substances which have accumulated in the bottom waters are distributed throughout the lake during mixing periods, they can trigger nuisance algal blooms, aquatic weed growth, taste and odor, and other water quality problems.

## SUMMARY AND RECOMMENDATIONS

### Summary

Waverly Lake, a small potable water supply lake in central Illinois, was sampled on 12 dates between May 1 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteers James Watts and Stanley Eyer recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Waverly Lake (10.8 inches) ranked 78th of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). This average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health and was in the range generally associated with use impairment problems for Illinois lakes.

Waverly Lake was extremely turbid throughout the 1981 sampling period; above normal rainfall during this time may have contributed lower normal transparency. Lowest transparencies were recorded in mid-June and August; field observations for these periods indicate that transparency was influenced by algae and suspended sediment. At other times, suspended sediment appeared to be the chief contributing agent to reduced transparency. Copper sulfate was used monthly to help control algae.

Site 1 on Waverly Lake is deep enough to thermally stratify during the summer. Since the lower limit of its euphotic zone (estimated twice the Secchi depth) is generally less than the total depth, low bottom water dissolved oxygen values, associated water quality problems, and limitation of fish habitat may be expected during summer stratification.

Waverly Lake is undergoing the process of eutrophication, as evidenced by transparency readings and field observations of algae and sediment problems. Protection from further degradation is critical. If nutrient and sediment input were controlled, lake quality would probably improve; failure to control inputs will probably result in continued rapid eutrophication. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

### Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to correct the identified problems.

Installation of Resource Management Systems in source areas of the watershed may reduce nutrient and sediment transport to the lake. Stabilization of the lake shoreline by riprap or some other means may also reduce sediment input.

In-lake management may also warrant consideration. Drawing oxygenated water from near the lake surface for water supply use may help alleviate taste and odor problems. Aeration-destratification to prevent dissolved oxygen depletion may promote a shift in algal populations to species other than the problem-causing blue-greens, reduce the need for copper sulfate, alleviate taste and odor problems, and improve fishing.



Continued monitoring is recommended for Waverly Lake. Consistent data gathered over a period of years is necessary to more fully document and evaluate water quality trends, identify problems, and evaluate lake/watershed management strategies.

#### REFERENCES

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## GLOSSARY\*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratification - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic settleable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen deficiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging through nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and enhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.



mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution emanating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.



pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy privileges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

water retention time - water residence time; period of time a mass of water remains in an impoundment.

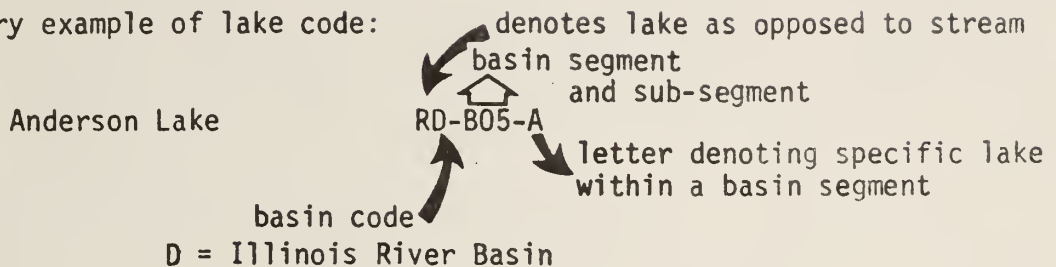
watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

## ABBREVIATIONS AND SYMBOLS

av - average  
brn - brown  
brnsh-grn - brownish-green  
grn-brn - green-brown  
grnsh-brn - greenish-brown  
lt - light  
max - maximum value  
min - minimum value  
mod - moderately  
std. dev. - standard deviation  
v - very

Explanatory example of lake code:



\*Definitions of items in sense used in text

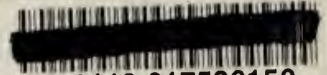
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## 1981 VOLUNTEER LAKE

### MONITORING PROGRAM REPORT

NATURAL HISTORY SURVEY

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1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT  
FOR  
VIENNA CORRECTIONAL CENTER LAKE, JOHNSON COUNTY, ILLINOIS

A Cooperative Citizen -  
Illinois Environmental Protection Agency  
Project

May, 1982  
Illinois Environmental Protection Agency  
2200 Churchill Road  
Springfield, Illinois 62706



## TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE</u>
Acknowledgements. . . . .	iii
Introduction. . . . .	1
Background. . . . .	1
Results and Discussion. . . . .	4
Summary and Recommendations . . . . .	9
References. . . . .	11
Glossary. . . . .	12

## LIST OF TABLES

<u>TABLE NO.</u>	<u>PAGE</u>
1. Lake Assessment Summary . . . . .	2
2. Secchi Disc Transparency. . . . .	5
3. Depth of Site . . . . .	5
4. Field Observations. . . . .	7

## LIST OF FIGURES

<u>FIGURE NO.</u>	<u>PAGE</u>
1. Lake Map. . . . .	3
2. Secchi Disc Transparency. . . . .	6

## ACKNOWLEDGEMENTS

This is one of 87 reports prepared for lakes in the 1981 Volunteer Lake Monitoring Program. It represents the coordinated effort of many individuals.

Illinois EPA's Ambient Monitoring Unit, Planning Section, Division of Water Pollution Control, under the direction of Kenneth R. Rogers, was responsible for the design and implementation of the program, as well as preparation of this report. Substantial assistance was provided by the Agency's Public Participation Section supervised by Gloria Craven.

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## INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

## BACKGROUND

Vienna Correctional Center Lake, a 70 acre impoundment owned by the State of Illinois, Vienna Correctional Center, is located in Johnson County approximately 7 miles east of Vienna, Illinois. The lake, which was constructed by damming an unnamed creek in 1964, has a maximum depth of 24 feet, an average depth of 12 feet, and a storage capacity of 8,400 acre-feet (Table 1).

Vienna Correctional Center Lake serves as a potable water supply for the Correctional Center. Recreational uses such as swimming and fishing are light. There is no public access.

Aquatic weeds are considered a moderate problem for the lake.

Assessment information on Vienna Correctional Center Lake was provided by the Illinois Department of Conservation (1977). Monitoring was performed by Davis C. Prewitt and Otto R. Roethe. Secchi disc depth, total depth and field observations were recorded at three sites (located in Fig. 1) on six dates in 1981.

TABLE 1. LAKE ASSESSMENT SUMMARY, VIENNA CORRECTIONAL CENTER LAKE, JOHNSON COUNTY, ILLINOIS (RA-B03-T).

I. GENERAL INFORMATION

River Basin: Ohio  
Segment: B03

Ownership: State of Illinois, Vienna Correctional Center

Surface Area (Acres): 70  
Watershed Area (Acres): 500  
Maximum Depth (Feet): 24.0  
Average Depth (Feet): 12.0  
Storage Capacity (Acre/Feet): 8,400  
Inflowing Stream(s):  
Outflowing Stream(s): Tributary of Bay Creek  
Water Retention Time: 13.444 year  
Lake Type: Dammed stream  
Year Constructed: 1964

II. USAGE

Public Access: no

Lake Usage:

Potable Water Supply: light  
Industrial Water Supply: none  
Agricultural Water Supply: none  
Cooling Water: none  
Recreation:

Fishing: light  
Swimming: light  
Power Boating:  
Row Boating or Canoeing:  
Sailboating:  
Camping:  
Picnicking:  
Waterfowl Hunting:  
Waterfowl Observation:  
Other:

Recreational Facilities:

Shoreline Usage (Percent):

Urban (Including Streets):  
Residential (Including Lawns):  
Golf Courses:  
Pasture or Grassland:  
Woodland:  
Row Crops:  
Wetland:  
Other: .

Watershed Usage (Percent):

Urban:  
Residential:  
Golf Courses:  
Pasture or Grassland:  
Woodland:  
Row Crops:  
Wetland:  
Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: good

Fishing:

Conditions and Extent:

Suspended Sediment: minimal  
Deposition of Sediment: minimal  
Algal Blooms:  
Aquatic Weeds: moderate  
Taste and/or Odor:  
Water Level Fluctuation:  
Fishkills: minimal  
Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:

Sewage Treatment Plant Effluent:  
Industrial Discharge:  
Urban Storm Drainage:  
Septic Tanks:  
Pasture or Grassland Runoff:  
Cropland Runoff:  
Feedlot Runoff:  
Construction Site Runoff:  
Fertilizer or Pesticides from  
Lawns/Golf Courses:  
Orchards:  
Forestry Operations Runoff:  
Mining:  
Waterfowl:  
Sediment in Lake:  
Other:

V. LAKE MANAGEMENT

Comments: Copper sulfate for algal control.

Information Supplied By Illinois Department of Conservation (1977)

FIGURE 1  
VIENNA CORRECTIONAL CENTER LAKE  
JOHNSON COUNTY





## RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report "Volunteer Lake Monitoring, 1981", Section IV "Understanding Illinois' Lakes."

The Secchi monitoring data for Vienna Correctional Center Lake are summarized in Table 2 and plotted in Figure 2. Total depth data are provided in Table 3, while field observations are summarized in Table 4.

### Transparency of Vienna Correctional Center Lake

The average Secchi disc transparency of Vienna Correctional Center Lake was 93.2 inches, which ranked number 4 when the average transparencies of the volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was greater than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976) and was above average for Illinois lakes.

### Spatial and Seasonal Differences in Transparency

The Secchi disc transparency of Vienna Correctional Center Lake ranged from a minimum of 36 inches at Site 3 on June 23 to a maximum of 132 inches at Site 1 on May 9.

As is typical of Illinois reservoirs, a spatial trend of increasing transparency from the lake headwaters to the dam was apparent in Vienna Correctional Center Lake. The average transparencies of Sites 3, 2 and 1 (headwaters to dam) were 87.0, 94.5, and 98.0 inches, respectively. Secchi readings were greater than or equal to the four feet minimum recommended for swimming on all sampling dates except June 23 (36 inches at Site 3). The lower Secchi readings at Site 3 were probably related, in part, to the shallow depth of the site (average depth 10 feet), and the stirring up of sediment by wind and wave activity. It may also reflect the input of nutrients and sediment from tributary streams.

There were seasonal differences in the transparency of Vienna Correctional Center Lake. The lowest transparencies were found in early summer, and were probably the result of increased amounts of suspended sediment caused by heavy rains which fell during this period.

Field observations indicate that the transparency of Vienna Correctional Center Lake is influenced primarily by the presence of algae. A greenish-brown water color was observed on most of the sampling dates and the lake was routinely treated with copper sulfate for algal control.

TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) VIENNA CORR./JOHNSON COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 9	132.0	123.0	100.0	121.0	12.1
06/ 8	72.0	60.0	48.0	60.0	12.0
06/ 23	48.0	48.0	36.0	44.0	6.0
07/ 11	120.0	120.0	114.0	118.0	3.5
07/ 31	06.0	06.0	06.0	06.0	0.0
08/ 10	120.0	120.0	120.0	120.0	0.0

\*\*\*SUMMARY STATISTICS\*\*\*

LAKE

SITES	MEAN	STD DEV	MIN	MAX	AV DEPTH
	98.0	32.6	48.0	132.0	23.4
	94.5	33.1	48.0	123.0	16.0
	87.0	32.2	36.0	120.0	10.0

-1 = missing value

See glossary for explanation of Summary Statistics.

TABLE 3

DEPTH OF SITE (FEET) VIENNA CORR./JOHNSON COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 9	22.0	16.0	0.0	15.7	6.5
06/ 8	26.0	18.0	11.0	18.3	7.5
06/ 23	23.0	15.5	10.0	16.2	6.5
07/ 11	23.0	18.0	10.0	17.0	6.6
07/ 31	23.0	16.0	10.0	16.3	6.5
08/ 10	23.5	18.2	10.0	17.2	6.8

\*\*\*SUMMARY STATISTICS\*\*\*

LAKE

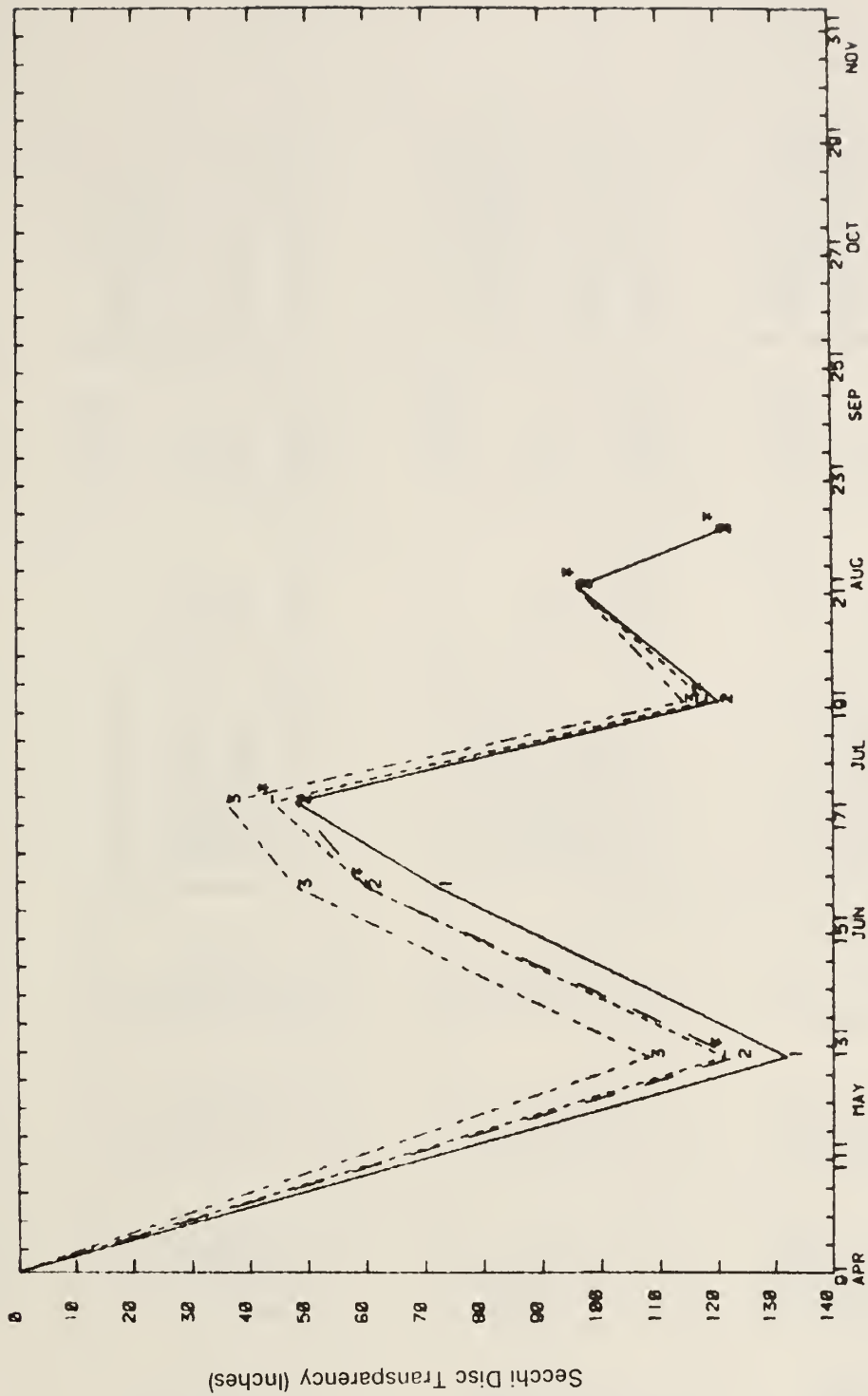
SITES	MEAN	STD DEV	MIN	MAX	AV DEPTH
	23.4	3.4	16.9	26.0	23.4
	22.0	1.2	15.5	26.0	23.4
	20.0	0.6	11.0	26.0	23.4

-1 = missing value

See glossary for explanation of Summary Statistics.

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) VIENNA CORR./JOHNSON COUNTY, ILLINOIS (VOLUNTEER DATA 1981)



KEY  
 1 Site 1  
 2 Site 2  
 3 Site 3  
 . Mean (Average)

TABLE 4. FIELD OBSERVATIONS, VIENNA CORRECTIONAL CENTER, JOHNSON COUNTY, ILLINOIS, 1981

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
5/9/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	mod. green minimal minimal none minimal none no odor	mod. green minimal minimal none minimal none no odor	mod. green minimal minimal none minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	overcast no rain calm warm S.W.	many clouds no rain calm warm S.W.	WATER LEVEL OF LAKE: 12" below normal RECREATIONAL USAGE: fishing  LAKE MANAGEMENT: 800 lbs. of CuSO <sub>4</sub> following disc readings ADDITIONAL COMMENTS: for algal control there were slight algal mats in shallow water areas.
6/8/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grnsh. brn. slight minimal none slight none no odor	grnsh. brn. slight minimal none slight none no odor	grnsh. brn. slight minimal none slight none no odor	WEATHER AT LAKE CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds no rain moderate hot S.W.	few clouds v. lt. rain moderate hot S.W.	WATER LEVEL OF LAKE: 1" above spillway RECREATIONAL USAGE:  LAKE MANAGEMENT: none ADDITIONAL COMMENTS:
6/23/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grnsh. brn. minimal minimal none slight none no odor	grnsh. brn. minimal minimal none slight none no odor	grnsh. brn. minimal minimal none slight none no odor	WEATHER AT LAKE CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain ripple hot S.E.	overcast v. lt. rain ripple hot S.W.	WATER LEVEL OF LAKE: 1" above spillway RECREATIONAL USAGE: none  LAKE MANAGEMENT: none ADDITIONAL COMMENTS:
7/11/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grnsh. brn. minimal minimal none minimal none no odor	grnsh. brn. minimal minimal none large 1 duck no odor	grnsh. brn. minimal minimal none large none no odor	WEATHER AT LAKE CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain calm v. hot no wind	few clouds v. lt. rain ripples hot S.W.	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing  LAKE MANAGEMENT: 7-11-81 100 lbs. CuSO <sub>4</sub> ADDITIONAL COMMENTS: for algal control



TABLE 4. FIELD OBSERVATIONS, VIENNA CORRECTIONAL CENTER, JOHNSON COUNTY, ILLINOIS, 1981

DATE	OBSERVATION	SITE			WEATHER AT LAKE			PRECEDING 24 HOURS		OTHER COMMENTS
		SITE 1	SITE 2	SITE 3	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	PRESENT	PRECEDING 24 HOURS			
7/31/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES:  ODOR:	brnsh. grn. minimal minimal none minimal none no odor	brnsh. grn minimal minimal none minimal 1 duck no odor	brnsh. grn. minimal minimal none minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain ripple hot S.E.	hazy no rain ripple hot S.W	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing  LAKE MANAGEMENT: 7-11-81 1,000 lbs. CuSO <sub>4</sub> ADDITIONAL COMMENTS: entire shoreline algae control		

DATE	OBSERVATION	SITE			WEATHER AT LAKE		PRECEDING 24 HOURS		OTHER COMMENTS
		SITE 1	SITE 2	SITE 3	PRESENT	24 HOURS			
8/10/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grnsh. brn. minimal minimal none minimal none no odor	grnsh brn. minimal minimal none moderate 1 duck no odor	grnsh. brn. minimal minimal none large none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds no rain ripple v. hot N.W.	few clouds v. lt. rain ripple v. hot N.W.	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: none  LAKE MANAGEMENT:  ADDITIONAL COMMENTS: no reading for last of August, 1981	

-8-

DATE	OBSERVATION			PRECEDING 24 HOURS		OTHER COMMENTS
	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	
	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:			CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:		WATER LEVEL OF LAKE: RECREATIONAL USAGE:  LAKE MANAGEMENT:  ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR; SEDIMENT; ALGAE; WEEDS AT SAMPLE SITE; WEEDS NEAR SHORE; OTHER SUBSTANCES; ODOR:				CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:			WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:



## Relationship to Lake Use

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Vienna Correctional Center Lake (estimated at twice the Secchi depth) ranged from 8.0-22.0 feet at Site 1, from 8.0-20.5 feet at Site 2, from 6.0-20.0 feet at Site 3. The euphotic zone extended to the bottom at Site 1 on May 9 and at Sites 2 and 3 on May 9, July 11, July 31 and August 10. The bottom waters at Sites 2 and 3 probably contain sufficient amounts of dissolved oxygen at most times, while at Site 1 low dissolved oxygen values would be expected in the bottom waters.

In the absence of dissolved oxygen, substances such as hydrogen sulfide, ammonia, methane, phosphorus, iron, and manganese may accumulate in the bottom waters. These substances can contribute to serious taste and odor problems in drinking water if water supply is taken from near the lake bottom during summer stratification. When the substances which have accumulated in the bottom waters during stratification periods are distributed throughout the lake during mixing periods, they can trigger nuisance algal blooms, aquatic weed growth, taste and odor, and other water quality problems.

## SUMMARY AND RECOMMENDATIONS

### Summary

Vienna Correctional Center Lake, a potable water supply impoundment in southern Illinois, was sampled on six dates between May 1 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteers Davis Prewitt and Otto Roethe recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Vienna Correctional Center Lake (93.2 inches) ranked 4th of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). This average transparency was greater than the four feet minimum recommended for swimming by the Department of Public Health and was above average for Illinois lakes. Field observations indicated that the transparency of Vienna Correctional Center Lake was influenced primarily by the presence of algae.

Vienna Correctional Center Lake is deep enough to thermally stratify during the summer. Since the lower limit of its euphotic zone (estimated at twice the Secchi depth) is generally less than the total depth at Site 1, low bottom water dissolved oxygen values, associated water quality problems, and limitation of fish habitat may be expected during summer stratification at that site.

Vienna Correctional Center Lake is undergoing the process of eutrophication as evidenced by transparency readings and field observations of algae, weed, and sediment problems. Protection from further degradation is critical. If nutrient and sediment input were controlled, lake quality would probably improve; failure to control inputs will probably result in continued rapid eutrophication. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

### Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to correct the identified problems.

Installation of agricultural Resource Management Systems in source areas of the watershed may reduce nutrient and sediment transport to the lake. Stabilization of the lake shoreline by riprap or some other means may also reduce sediment input. Nutrient contributions from septic tanks, fertilization of lawns, and waterfowl should also be investigated and minimized.

In-lake management may also warrant consideration. Drawing oxygenated water from the upper strata for water supply use may help alleviate taste and odor problems. Aeration-destratification to prevent dissolved oxygen depletion may promote a shift in algal populations to species other than the problem-causing blue-greens, reduce the need for copper sulfate, help alleviate taste and odor problems, and improve fishing. Harvesting of aquatic weeds or use of screens might also be considered.

Continued monitoring is recommended for Vienna Correctional Center Lake. Consistent data gathered over a period of years is necessary to more fully document and evaluate water quality trends, identify problems, and evaluate lake/watershed management strategies.

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DS:jab/sp3873C

## GLOSSARY\*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratification - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.



borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic settleable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen deficiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging through nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.



green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and enhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution emanating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy privileges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.



suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

water retention time - water residence time; period of time a mass of water remains in an impoundment.

watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

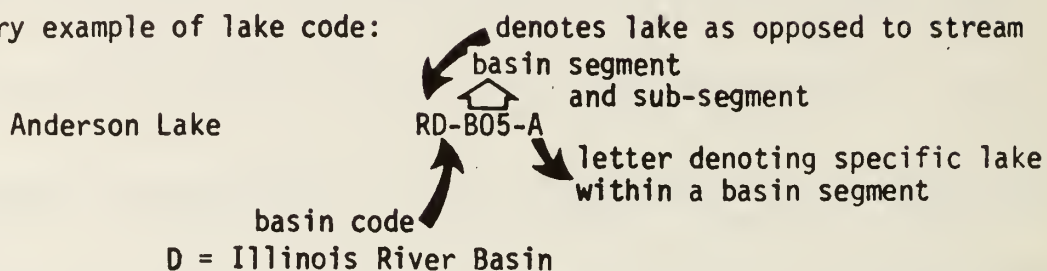
zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.



## ABBREVIATIONS AND SYMBOLS

av - average  
brn - brown  
brnsh-grn - brownish-green  
grn-brn - green-brown  
grnsh-brn - greenish-brown  
lt - light  
max - maximum value  
min - minimum value  
mod - moderately  
std. dev. - standard deviation  
v - very

Explanatory example of lake code:



\*Definitions of items in sense used in text

DS:sp,6207a,1-8



UNIVERSITY OF ILLINOIS-URBANA  
551 482V889X C002  
VOLUNTEER LAKE MONITORING PROGRAM SPRIN  
1981:82



3 0112 017526143

551.482  
V 889x  
1981: 81  
Copy 2

Nat. Hist. Surv.

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY  
DIVISION OF WATER POLLUTION CONTROL  
2200 CHURCHILL ROAD  
SPRINGFIELD, ILLINOIS 62706



# 1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT

NATURAL HISTORY SURVEY

AUG 25 1981

11RD107



Vernor Lake / Richland Co.





1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT  
FOR  
VERNOR LAKE, RICHLAND COUNTY, ILLINOIS

A Cooperative Citizen-  
Illinois Environmental Protection Agency  
Project

May, 1982  
Illinois Environmental Protection Agency  
2200 Churchill Road  
Springfield, Illinois 62706

## TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE</u>
Acknowledgements. . . . .	iii
Introduction. . . . .	1
Background. . . . .	1
Results and Discussion. . . . .	3
Summary and Recommendations . . . . .	9
References. . . . .	11
Glossary. . . . .	12

## LIST OF TABLES

<u>TABLE NO.</u>	<u>PAGE</u>
1. Lake Assessment Summary . . . . .	2
2. Secchi Disc Transparency. . . . .	5
3. Depth of Site . . . . .	5
4. Field Observations. . . . .	7

## LIST OF FIGURES

<u>FIGURE NO.</u>	<u>PAGE</u>
1. Lake Map. . . . .	4
2. Secchi Disc Transparency. . . . .	6

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This is one of 87 reports prepared for lakes in the 1981 Volunteer Lake Monitoring Program. It represents the coordinated effort of many individuals.

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## INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A report entitled "Volunteer Lake Monitoring, 1981", which summarizes all the volunteer data, was prepared. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

## BACKGROUND

Vernor Lake is a 36 acre impoundment owned by the City of Olney, Richland County, Illinois. The impoundment, which was constructed by damming an unnamed creek in approximately 1927, has a maximum depth of 27 feet, an average depth of 15 feet and a storage capacity of 540 acre-feet (Table 1).

Vernor Lake serves as a recreational lake used primarily for fishing, swimming, and row boating or canoeing. Access is free and unlimited.

The 300 acre watershed of Vernor Lake is estimated to be 80 percent residential. The lake shoreline is also primarily residential.

Algal blooms, aquatic weeds and water level fluctuation are considered substantial problems for Vernor Lake, while deposition of sediment is considered a moderate problem. Septic tanks, fertilizer/pesticides from lawns/golf courses and pasture, grassland and feedlot runoff are cited as major pollution sources. Some efforts have been made to end feedlot runoff.

TABLE 1. LAKE ASSESSMENT SUMMARY, VERNOR LAKE, RICHLAND COUNTY, ILLINOIS (RC-A09-A).

# I. GENERAL INFORMATION

River Basin: Little Wabash  
Segment: A09

Ownership: City of Olney

Surface Area (Acres): 36\*  
Watershed Area (Acres): 300\*  
Maximum Depth (Feet): 27  
Average Depth (Feet): 15  
Storage Capacity (Acre/Feet): 540\*  
Inflowing Stream(s): Unnamed Creek  
Outflowing Stream(s): Fox Creek  
Water Retention Time: 1.802\*  
Lake Type: Dammed Stream  
Year Constructed: 1927

# II. USAGE

Public Access: yes

## Lake Usage:

Potable Water Supply: none  
Industrial Water Supply: none  
Agricultural Water Supply: none  
Cooling Water: none  
Recreation:  
Fishing: moderate  
Swimming: moderate  
Power Boating: none  
Row Boating or Canoeing: moderate  
Sailboating: light  
Camping: none  
Picnicking: light  
Waterfowl Hunting: none  
Waterfowl Observation: light  
Other:

## Recreational Facilities:

Picnic area, boat launches

## Shoreline Usage (Percent):

Urban (Including Streets):  
Residential (Including Lawns): 75%  
Golf Courses:  
Pasture or Grassland:  
Woodland:  
Row Crops:  
Wetland:  
Other: Public Access 25

## Watershed Usage (Percent):

Urban:  
Residential: 80  
Golf Courses: 10  
Pasture or Grassland:  
Woodland: 5  
Row Crops:  
Wetland: 5  
Other:

# III. WATER QUALITY AND PROBLEMS

General Water Quality: good

Fishing: good

## Conditions and Extent:

Suspended Sediment: minimal  
Deposition of Sediment: moderate  
Algal Blooms: large  
Aquatic Weeds: large  
Taste and/or Odor: slight  
Water Level Fluctuation: large  
Fishkills: minimal  
Other:

# IV. CAUSES OF WATER QUALITY PROBLEMS

## Potential Pollution Sources:

Sewage Treatment Plant Effluent:  
Industrial Discharge:  
Urban Storm Drainage:  
Septic Tanks: yes  
Pasture or Grassland Runoff: yes  
Cropland Runoff:  
Feedlot Runoff: yes  
Construction Site Runoff:  
Fertilizer or Pesticides from  
Lawns/Golf Courses: yes  
Orchards:  
Forestry Operations Runoff:  
Mining:  
Waterfowl:  
Sediment in Lake:  
Other:

# V. LAKE MANAGEMENT

Comments: Some efforts has been made to end

feedlot runoff.

\*Information Supplied By Arthur O. Omland (1981) \*Illinois Department of Conservation (1977).



Assessment information for Vernor Lake was provided by Arthur O. Omland and the Illinois Department of Conservation. Monitoring was performed by Arthur Omland. Secchi disc depth, total depth, and field observations were recorded at three sites (located in Fig. 1) on eight dates in 1981: May 12, June 3 and 17, July 3 and 19, August 17, September 18 and October 5.

## RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report, "Volunteer Lake Monitoring, 1981", Section IV, "Understanding Illinois' Lakes."

The Secchi monitoring data for Vernor Lake are summarized in Table 2 and plotted in Fig. 2. Total depth data are provided in Table 3, while field observations are summarized in Table 4.

### Transparency of Vernor Lake

The average Secchi disc transparency of Vernor Lake was 70.0 inches, which ranked 11th when the average transparencies of the volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was greater than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976) and was above average for Illinois lakes.

### Spatial and Seasonal Differences in Transparency

The Secchi disc transparency of Vernor Lake ranged from a minimum of 30 inches at Site 3 on May 12 to a maximum of 120 inches at Sites 1 and 2 on July 3.

The clarity at Sites 1 and 2 was generally the same, while it was lower at Site 3. Transparencies averaged 84 inches, 84 inches, and 42 inches at Sites 1, 2 and 3, respectively. Readings at Site 2 were greater than or equal to four feet, the minimum recommended for swimming, on all sampling dates, while at Site 1, it was less than four feet on September 18. Secchi values at Site 3 were less than four feet on May 12, June 3 and 17, and September 18. The lower Secchi values at Site 3 were probably related, in part, to the shallow depth of the site (average depth 7.1 feet) and the stirring up of sediment by wind and wave activity. It may also reflect the input of nutrients and sediment from the tributary streams.

**FIGURE 1**  
**VERNOR LAKE**  
**RICHLAND COUNTY**

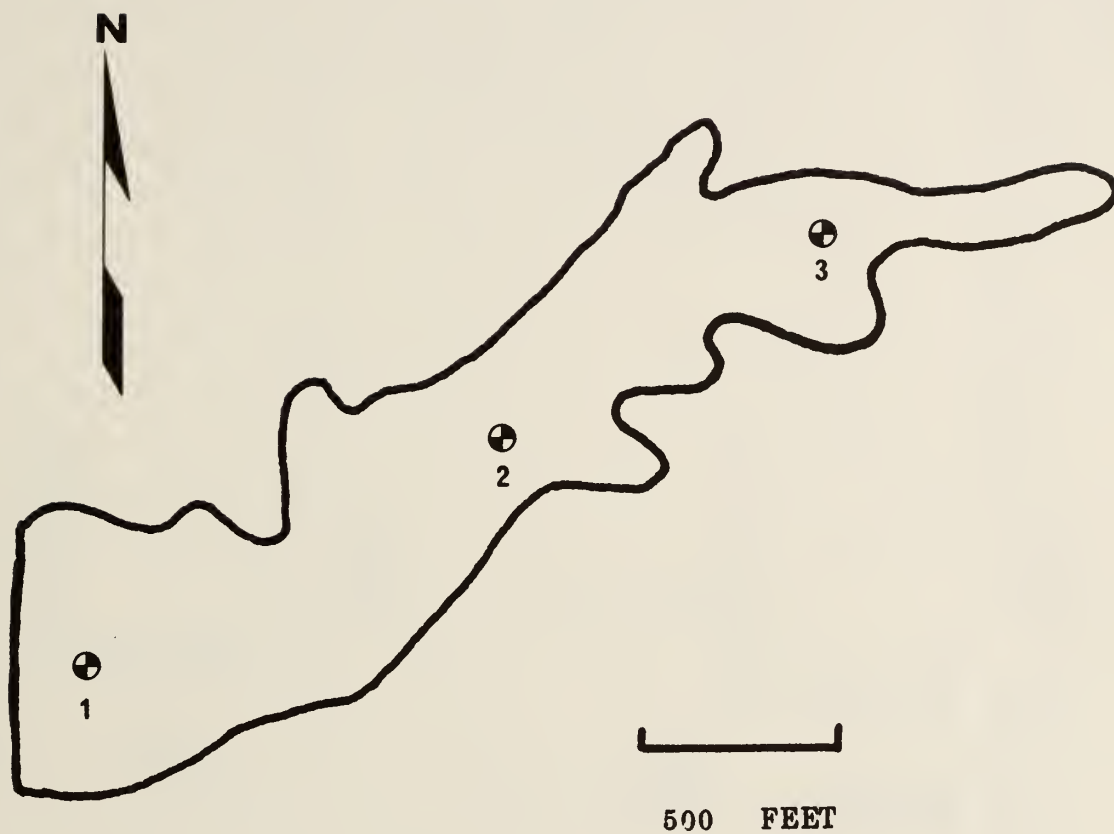


TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) VERNOR/RICHLAND COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/12	50.0	60.0	30.0	50.0	17.3
06/13	90.0	90.0	36.0	72.0	31.2
06/17	78.0	78.0	36.0	64.0	24.2
07/13	120.0	120.0	48.0	96.0	41.6
07/19	96.0	96.0	48.0	80.0	27.7
08/17	102.0	96.0	48.0	82.0	29.6
09/18	42.0	48.0	42.0	44.2	3.5
10/5	84.0	84.0	48.0	72.0	20.8

## \*\*\*SUMMARY STATISTICS\*\*\*

SITES	LAKE
MEAN	84.0
STD DEV	24.4
MIN	42.0
MAX	120.0
AV DEPTH	25.8

-1 = missing value

See glossary for explanation of Summary Statistics.

TABLE 3

DEPTH OF SITE (FEET) VERNOR/RICHLAND COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/12	25.0	16.0	9.0	16.7	8.0
06/13	27.5	17.5	9.5	18.2	9.0
06/17	27.0	16.5	9.0	17.5	9.2
07/13	26.0	18.0	6.0	16.7	10.1
07/19	25.5	17.5	6.0	16.3	9.8
08/17	24.0	18.0	5.5	15.8	9.4
09/18	27.0	17.0	6.0	16.7	10.5
10/5	24.0	17.0	5.5	15.5	9.3

## \*\*\*SUMMARY STATISTICS\*\*\*

SITES	LAKE
MEAN	25.8
STD DEV	17.2
MIN	9.0
MAX	27.5
AV DEPTH	25.8

-1 = missing value

See glossary for explanation of Summary Statistics.

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) VERNOR/RICHLAND COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

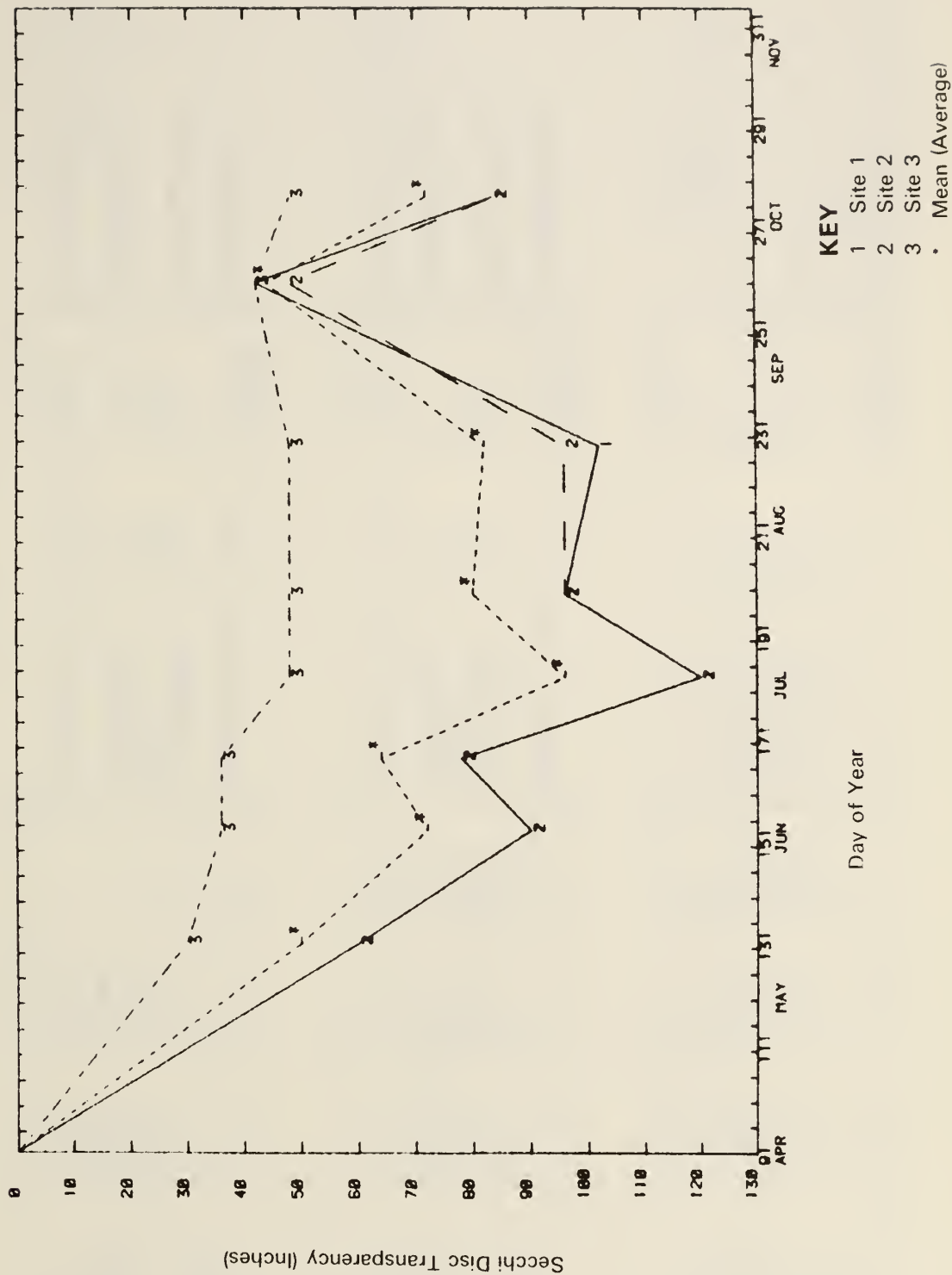


TABLE 4. FIELD OBSERVATIONS, LAKE VERNOR, RICHLAND COUNTY, ILLINOIS, 1981

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
5/12/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn moderate moderate moderate algal col. no odor	brnsh-grn. moderate moderate moderate algal col. no odor	mod. brn. moderate slight large large water lilies no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	hazy no rain ripple cool S.E.	many clouds heavy rain mod. rain cool S.E.	WATER LEVEL OF LAKE: below normal RECREATIONAL USAGE: fishing  LAKE MANAGEMENT: 5-4-81 hand broadcast crystals & drag bay * ADDITIONAL COMMENTS: * 400#CuSO4 heavy weed & moss
6/3/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn slight minimal minimal slight brackish no odor	brnsh-grn slight minimal minimal slight brackish no odor	brnsh-grn moderate moderate minimal moderate algal mats colonies no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	hazy no rain calm hot S.E.	many clouds mod. rain calm hot S.E.	WATER LEVEL OF LAKE: full RECREATIONAL USAGE: none  LAKE MANAGEMENT: 5-4-81 CuSO4 for weeds & moss control ADDITIONAL COMMENTS: lake is full and very little water going over the dam
6/17/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh.-grn slight minimal minimal slight brackish water no odor	brnsh-grn slight minimal minimal slight brackish water no odor	brnsh-grn moderate moderate minimal moderate algal mats colonies no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain ripple warm S.E.	clear no rain ripple warm S.E.	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing  LAKE MANAGEMENT: 6-9-81 400# CuSO4 used to control weeds ADDITIONAL COMMENTS: Water started to clear up but is now brackish again
7/3/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grnsh-brn. minimal minimal minimal slight waterfowl no odor	grnsh-brn minimal minimal minimal slight waterfowl no odor	v. green moderate moderate slight moderate algal mats no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds mod. rain ripple warm S.E.	overcast lt. rain ripple warm S.E.	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing, row boating/ canoeing  LAKE MANAGEMENT: Shoreline is still a little brackish from CuSO4 applied 6-9-81. * ADDITIONAL COMMENTS: * Weeds turning brown and starting to sink.



TABLE 4. FIELD OBSERVATIONS, LAKE VERVOOR, RICHLAND COUNTY, ILLINOIS, 1981

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
7/19/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grnsh-brn. minimal minimal minimal none	grnsh-brn. minimal minimal water fowl none		CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain ripple warm S.E.	many clouds mod. rain ripple warm S.E.	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: swimming, row boating, canoeing  LAKE MANAGEMENT: none  ADDITIONAL COMMENTS: weeds near shore are brown but didn't sink yet.
8/17/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	v. green moderate slight moderate none	v. green moderate slight moderate none	v. brown large moderate large algal mats fishy	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain ripple warm S.E.	many clouds mod. rain moderate warm N.W.	WATER LEVEL OF LAKE: below normal RECREATIONAL USAGE: none  LAKE MANAGEMENT: none  ADDITIONAL COMMENTS: full and running over
9/18/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	mod. green moderate slight large none	mod. green moderate moderate large none	pea soup moderate moderate large large algal mats fishy	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	hazy no rain ripple warm	many clouds v. lt. rain small warm	WATER LEVEL OF LAKE: above normal RECREATIONAL USAGE: normal  LAKE MANAGEMENT:  ADDITIONAL COMMENTS:
10/5/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grnsh-brn slight slight slight moderate none	grnsh-brn. slight slight slight moderate none	pea soup moderate large large large algal mats no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain ripple hot S.E.	many clouds v. lt. rain small cool S.E.	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: none  LAKE MANAGEMENT:  ADDITIONAL COMMENTS: Green dye was put in a neighbors septic tank and it is now all over this end of the lake.

There were seasonal differences in the transparency of Vernor Lake. Lowest transparencies were generally recorded in late summer, and were probably the result of algal blooms.

Field observations of water color and amount of suspended sediment and algae indicate that the transparency of Vernor Lake is influenced by both suspended sediment and algae from spring to midsummer and primarily by algae in mid to late summer. The water color was brownish-green in May and June; greenish-brown in July; green in August and September; and greenish-brown in October. Aquatic weeds were noted as abundant, particularly at Site 3. This may reflect the shallow nature of the site and/or the occurrence of nutrient input there. The lake was routinely treated with copper sulfate for weed and moss control.

### Relationship to Lake Use

Secchi disc transparency may help a fisherman locate the most likely fish habitat. It may also indicate the potential of the lake for exhibiting water quality and use impairment problems.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Vernor Lake ranged from 7-20 feet at Site 1, 8-20 feet at Site 2, and 5-8 feet at Site 3. Since Site 1 is deep enough to thermally stratify and had a euphotic zone that was less than total depth, low dissolved oxygen values would be expected in the bottom waters. The euphotic zone extended to the bottom at Site 2 on July 3 and at Site 3 from July 3 to October 5.

In the absence of dissolved oxygen, substances such as hydrogen sulfide, ammonia, methane, phosphorus, iron, and manganese may accumulate in the bottom waters. When these substances are distributed throughout the lake during mixing periods, they can trigger nuisance algal blooms, aquatic weed growth, and other water quality problems.

## SUMMARY AND RECOMMENDATIONS

### Summary

Vernor Lake, a small, relatively deep recreational lake in south-central Illinois, was sampled for eight dates between May 1 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteer Arthur Omland recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Vernor Lake (70.0 inches) ranked 11th of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). This average transparency was greater than the four feet minimum recommended for swimming by the Department of Public Health and was above average for Illinois lakes.

Site 1 on Vernor Lake is deep enough to thermally stratify during the summer. Since the lower limit of its euphotic zone (estimated at twice the Secchi depth) is generally less than the total depth, low bottom water dissolved oxygen values, associated water quality problems, and limitation of fish habitat may be expected during summer stratification.

Vernor Lake is undergoing the process of eutrophication as evidenced by transparency readings and field observations of algae, weed, and sediment problems. Protection from further degradation is critical. If nutrient and sediment input were controlled, lake quality would probably improve; failure to control inputs will probably result in continued rapid eutrophication. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

### Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Installation of Resource Management Systems in source areas of the watershed may reduce nutrient and sediment transport to the lake. Stabilization of portions of the lake shoreline by riprap or some other means may also reduce sediment input. Nutrient contributions from septic tanks, fertilization of lawns, and waterfowl should also be investigated and minimized.

In-lake management may also warrant consideration. Aeration-destratification to prevent dissolved oxygen depletion may promote a shift in algal populations to species other than the problem causing blue-greens, reduce the need for copper sulfate and improve fishing. Harvesting or use of screens to control aquatic weeds might also be considered.

Continued monitoring is recommended for Vernor Lake. Consistent data gathered over a period of years is necessary to more fully document water quality trends, identify problems, and evaluate lake watershed management strategies.

## REFERENCES

Illinois Department of Conservation. 1977. Illinois Inland Lakes Problems Assessment Data Form, filled out for Illinois Environmental Protection Agency, "Assessment and Classification of Illinois Lakes."

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Illinois Environmental Protection Agency. 1982. Volunteer Lake Monitoring, 1981. A Cooperative Citizen - Illinois Environmental Protection Agency project. Monitoring Unit; Division of Water Pollution Control, Illinois EPA, Springfield, Illinois.

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## GLOSSARY\*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratification - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.



borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic settleable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other. like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen deficiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging through nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and enhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution emanating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy privileges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.



Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.



suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

water retention time - water residence time; period of time a mass of water remains in an impoundment.

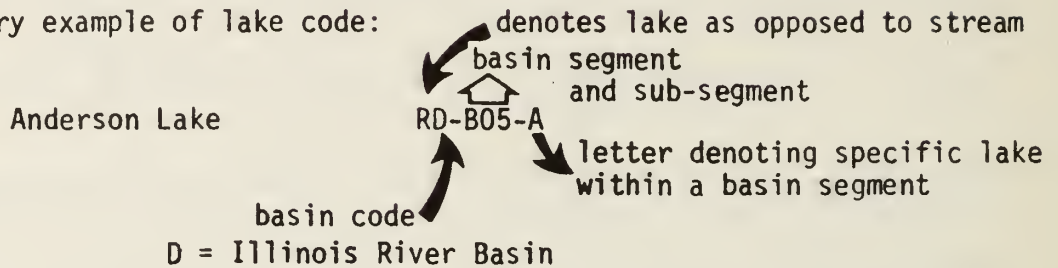
watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

## ABBREVIATIONS AND SYMBOLS

av - average  
brn - brown  
brnsh-grn - brownish-green  
grn-brn - green-brown  
grnsh-brn - greenish-brown  
lt - light  
max - maximum value  
min - minimum value  
mod - moderately  
std. dev. - standard deviation  
v - very

Explanatory example of lake code:



\*Definitions of items in sense used in text

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